PMM

DECEMBER

1956

Precision Metal Molding

INCLUDING DIE CASTINGS MAGAZINE

devoted exclusively to:

DIE CASTINGS

INVESTMENT CASTINGS

PERMANENT MOLD CASTINGS

PLASTER MOLD CASTINGS

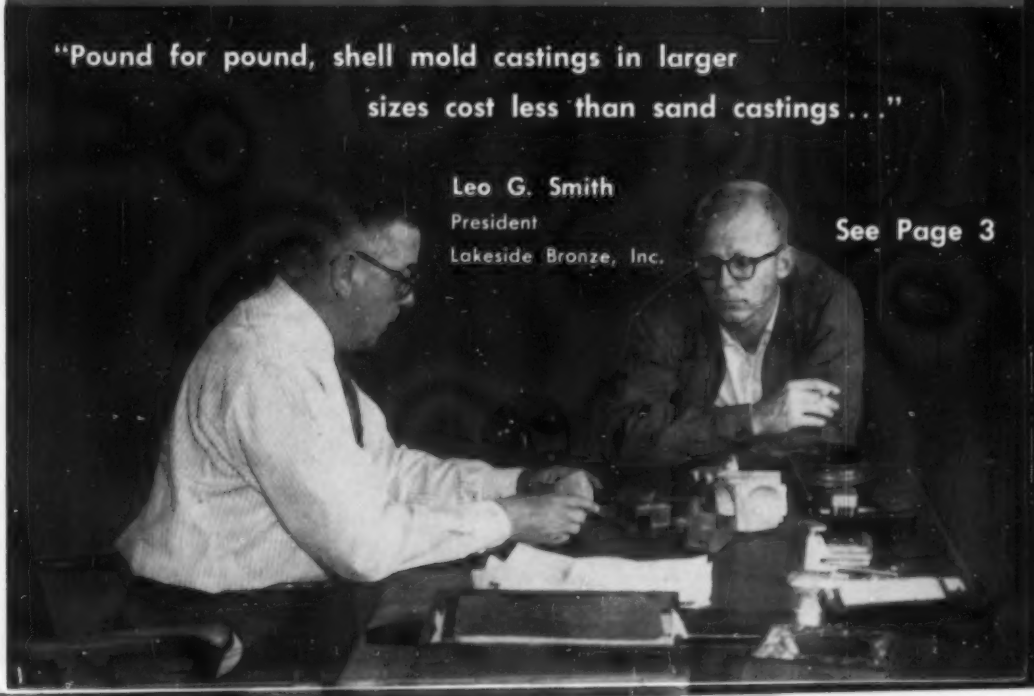
POWDER METALLURGY

SHELL MOLD CASTINGS

"Pound for pound, shell mold castings in larger sizes cost less than sand castings . . ."

Leo G. Smith
President
Lakeside Bronze, Inc.

See Page 3



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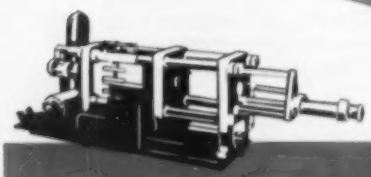
The new Cast-Master Model-M for die casting magnesium, brings to the industry a safer, faster, more economical method for producing magnesium castings than ever before. The machine embodies the same fine features of other Cast-Master die casting machines. The "Dow type" hot end for die casting magnesium is used for metal injection. This end is similar to a zinc hot chamber arrangement thereby eliminating the disadvantage of hand ladling and making high speed production possible.

Illustration shows Magnesium Hot End Attachment on a Cast-Master Model 20 Die Casting Machine.



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CAST-MASTER *Inc.* **23901 AURORA ROAD**
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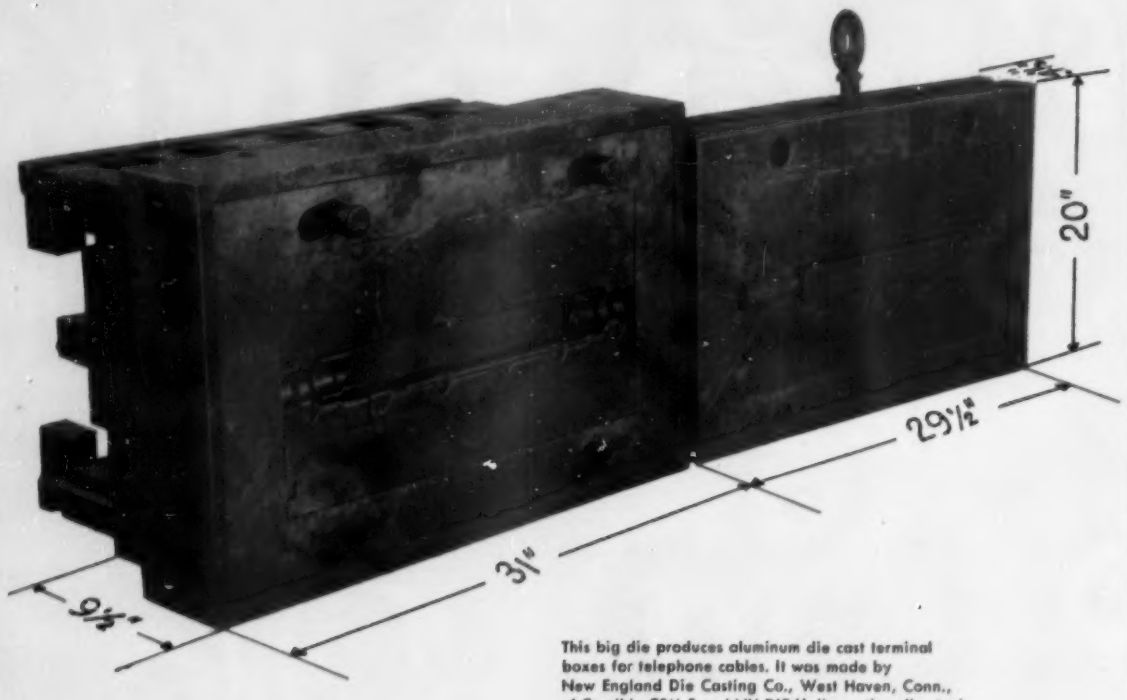
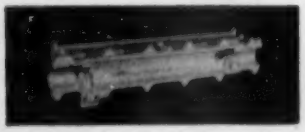


This big die produces aluminum die cast terminal boxes for telephone cables. It was made by New England Die Casting Co., West Haven, Conn., of Crucible CSM 2 and NU DIE V die casting die steels.

it's made of

ultrasonically inspected



CSM 2 and NU DIE V

...from Crucible warehouse stock

The die above, built by New England Die Casting Company, West Haven, Connecticut, casts aluminum electrical terminal boxes. The holder block is prehardened CSM 2 – the insert NU DIE V – both promptly obtained from local Crucible warehouse stocks.

Crucible CSM 2 and NU DIE V are made for and inspected to die casting steel quality. They're an unbeatable combination – perfect for holder blocks, solid dies, inserts or sleeves – for any die casting application.

What's more, delivery is from local warehouse stock – in 438 sizes – 1" to 40" wide . . . ¾" to 15" thick – all ultrasonically inspected. You just can't beat Crucible die steels for quality or availability. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

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COVER STORY

THE BIGGER THEY ARE, the better they are. Comparing shell mold castings with sand castings here are L. G. Smith, president, and R. Graber, vice president, of Lakeside Bronze. Their story begins on page 40.

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USCO K-Z Aluminum Die-Casting Alloy is a high zinc variation of the popular USCO K. In other words, USCO K-Z is an AXS-679 Revision 3 alloy with zinc up to 2% maximum. The physical properties of K alloy are retained in the K-Z alloy, at a price saving to you.

USCO K-Z, like all other USCO Aluminum Alloys, is production and quantometric controlled from raw materials to finished ingot under the most modern methods of alloying and refining—giving you the properties you desire in your castings.

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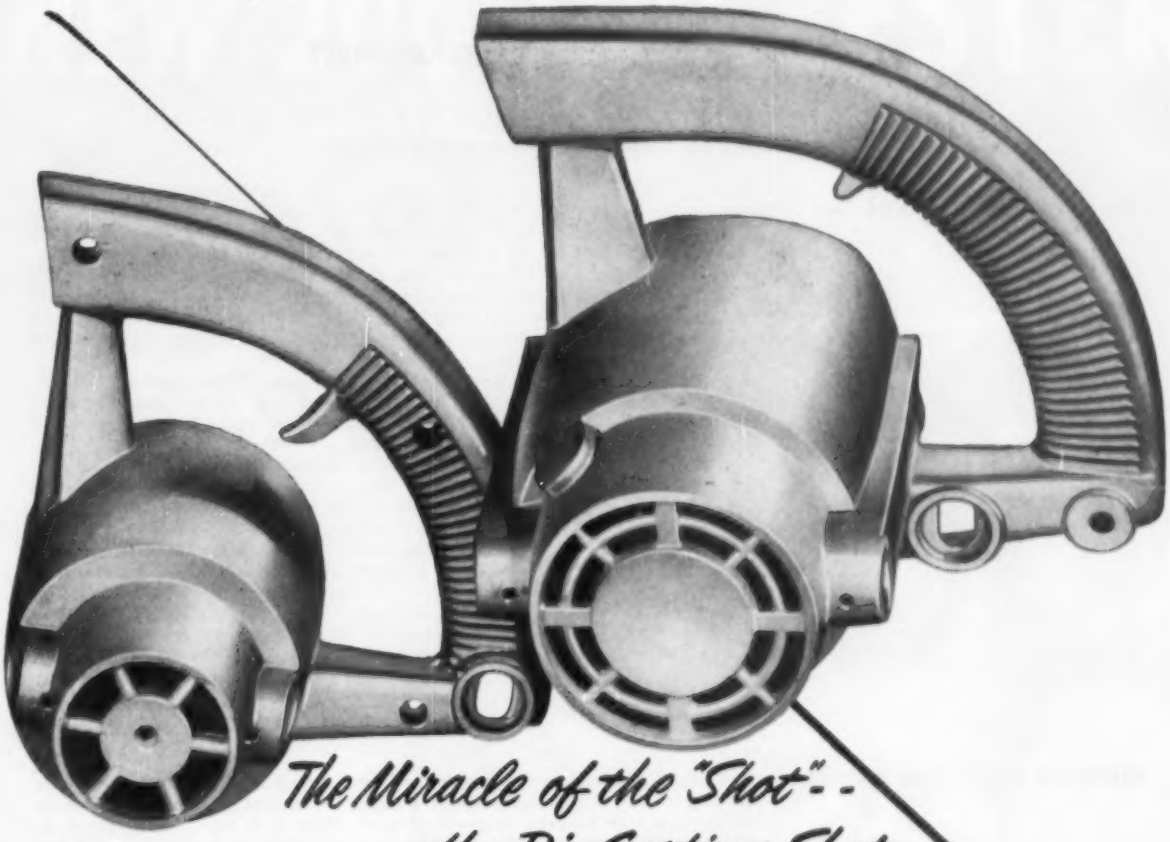

The Miracle of the "Shot"--
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The "Shooting" of a die casting is spectacular far beyond what can be imagined, even by examining complicated die castings.

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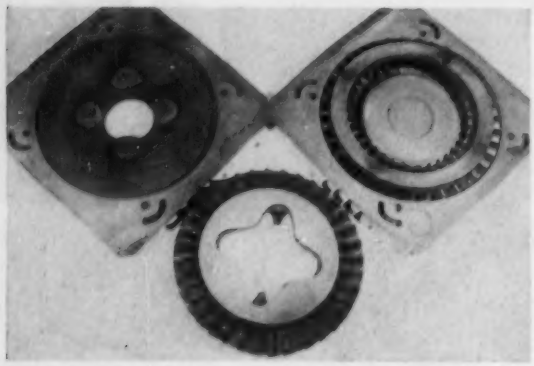
CASTING ABOUT

technical news of applications
& processes involving precision metal moldings

FOR BETTER NOZZLE RINGS used in diesel engine turbosuperchargers Allegheny Ludlum Steel Corporation has developed a new and unusual casting method which is called Almold casting. This process, now used by the company to make nozzle rings for turbosuperchargers built by ALCO Products, Inc., of Schenectady and installed on ALCO diesel engines, represents a change from the older sand mold method formerly used. Almold methods were developed by engineers at Allegheny Ludlum's Forging and Casting and Watervliet plants.



In the Almold process, type 321 stainless steel nozzle ring vanes are placed in a box cavity. The pieces are accurately positioned and then type 410 stainless steel is cast around the vanes.

Tolerance — a major consideration in the exacting procedure — is .010. The outside diameter of the nozzle ring hub is cast to a finish size between .000 to + .20 tolerance, with ⅛ inch to finish on the face.

The exhaust gases that beat upon the nozzle ring under operation on a Diesel engine reach 1245° for extended periods of time.

Allegheny Ludlum's new Almold production method has saved money for ALCO, but more important it has resulted in a better nozzle ring fabricated from a higher quality steel than was possible with sand core casting.

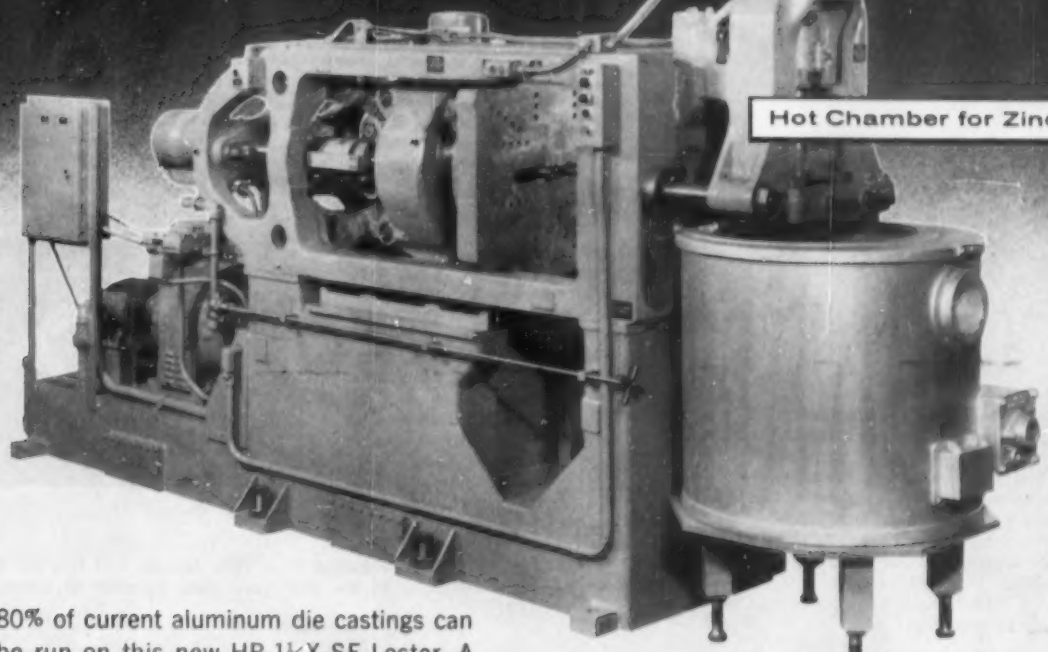
PRACTICAL DIE CASTING POINTERS are contained in a new booklet published by Henning Bros. & Smith, zinc alloy producers. The booklet, principally a guide to die casting machine operators, makes available material long-out-of-print. Most of it was written by R. L. Wilcox, now assistant to the vice president of American Smelting & Refining Co., when he was an executive of the old Gerity-Michigan Die Casting Company. A great deal of additional material is now included, among which is a portion from H. H. Doehler's book "Die Casting." The 32-pg. booklet is free. We'll be glad to forward your request to Henning Bros. & Smith. It contains sections on: alloy temperature, gating and venting the die, injection pressure, surface finish of the die, die temperature and many others.

TWICE AS MANY ALUMINUM CASTINGS, produced at lower unit cost, resulted from a chain link fence manufacturer's decision to do his own shell molding with phenolic resins. Formerly, Allied Chain Link Fence Co., Houston, Texas, used four green sand foundries to supply cast aluminum fittings for its fences. The company based its decision to try shell molding on the simplicity and economy of the process.

Ordinarily, shell molding is favored for the high degree of dimensional accuracy and close tolerances it offers, but Allied was attracted to the method by the possibility for unit cost savings from integrated, flexible production with reduced labor and fewer finishing operations. Thin shell molds in which particles of sand are bonded together by Bakelite phenolic resins produce smooth as-cast surfaces free from burnt-in or burnt-on sand. Such castings need little or no finishing.

Instead of machining out holes

NEW 200 TON LESTER
DIE CASTING MACHINES



Hot Chamber for Zinc

80% of current aluminum die castings can be run on this new HP-1½X-SF Lester. A comparable percentage can be run on the zinc counterpart, the HP-1½Z-SF. Die movement has been increased from 8″ to 10″ for deeper draw castings. Horizontal clearance between the beams has been enlarged from 14″ to 17″, giving 21% more access for lowering large dies through the top of the frame. Strain gage testing has shown that the new frame and toggle design locks the machine at considerably more than its rated tonnage. Here is the machine that fills a vital need in the die casting industry.

Cold Chamber for Aluminum

LESTER-PHOENIX, INC.
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Agents in principal cities throughout the world
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Dodge Custom-made **Special Alloy Steel Goosenecks**

. . . for longer service life

. . . less maintenance

Here's the biggest news in die casting in years: a custom-made special alloy *steel* gooseneck that will outlast and outperform iron and alloy iron goosenecks currently available . . . and provide greater operational savings! Developed through years of experience and association with the die castings industry, Dodge Special Alloy *Steel* Goosenecks provide many advantages:

- Will outlast iron and alloy iron goosenecks by as much as 4-5 years.
- Maintenance problems are fewer because of long service life.
- Down time is reduced to a minimum because of long service life.
- Designed and made of special alloy *steel*, they prevent cracking . . . bottom breakout . . . spout erosion.

Each Dodge Special Alloy *Steel* Gooseneck is custom made to specifications by the Finished Products Division of Dodge Steel Company. Facilities are available for producing any size gooseneck for any die casting machine. Goosenecks are furnished either rough machined or machined with sleeves. Dodge provides a complete engineering service in the designing and production of steel goosenecks.

Your inquiries are solicited, without obligation, of course. Ask too, about pots and other die casting machine parts including nozzles, spouts, plungers, etc.

DODGE STEEL COMPANY

FINISHED PRODUCTS DIVISION
6501 Tacony Street
Philadelphia 35, Pa.

THE MOST IMPORTANT ALLOY IN A STEEL CASTING IS QUALITY

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CASTING ABOUT

continued from page 6

for attaching fittings to fence posts, Allied uses the same phenolic material for cores to cast fittings with the needed openings. Blowholes and other surface imperfections are eliminated by the ability of the porous shell to allow gases to escape when pouring the molten metal.

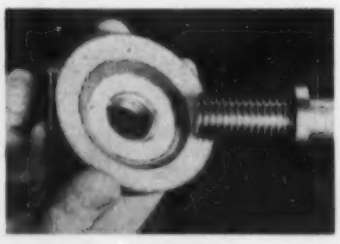
During cooling cycles shell molds permit freedom for metal shrinkage and thus reduce the number of rejects.

Allied's new shell mold foundry now produces more than 60 different castings of fittings or ornaments for fence posts and gates. About 6,000 pounds of metal are poured per day into shell molds at the foundry. Since shell molds are light in weight, relatively small in volume, and have the dimensional stability, they can be prepared in advance and stored without taking up very much foundry floor space.

FLOATING BLANKET of polyethylene shapes, such as these, may save platers and others working with process solutions millions of dollars in evaporation losses. These expanded polyethylene miniature floats, containing thousands of tiny air cells, have been introduced by American Agile Corp. of Maple Heights, Ohio. Being highly resistant to all chemical and solvent reaction, they float together to form an interlocking "blanket" on the surface of the volatile solution. Technical data: bulk density — 17 lbs. per cubic feet; material density — 35 lbs. per cubic foot; number of pieces per pound — 240.

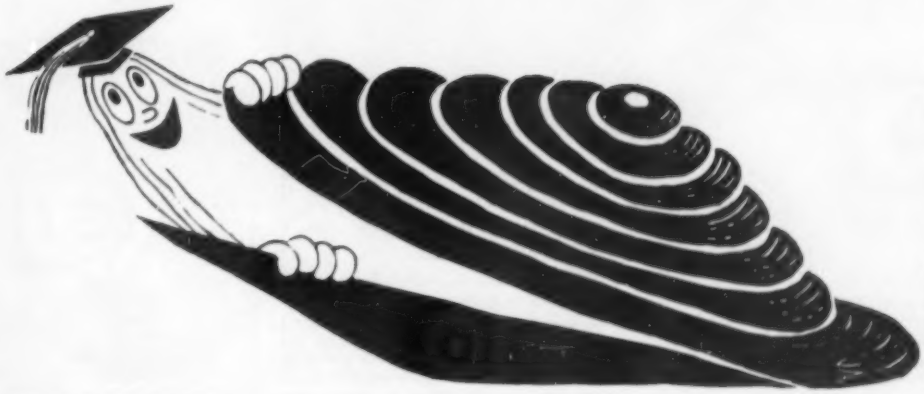
"YOU CANNOT TELL A MANUFACTURER what you want in a finished part and tell him how to do the job, too," according to Joseph Gurski, assistant manager of Ford Motor Company's Manufacturing Research Department. In an address before the Seventh National Conference on Standards in New York recently, he said, "Obviously the best procedure is to specify the attributes and permit latitude in materials and processing. Improper specifications can result in unnecessary payments of many thousands of dollars . . . The field of cost reduction is fertile. It is costly to pay for requirements which add absolutely nothing to the end product."

On the subject of timing he commented, "As a result of the more complicated parts we have today and the importance that is placed on processing cost, with resulting automation and more complicated machines, the problem of planning and timing assumes greater importance. This is typified by the illustration that, at Ford, orders were placed for transmissions, engines, rear axles, major stamping dies, pumper impact bars and die castings for our 1955 model cars at 23, 17, 16, 14, 11 and 7 months respectively ahead of production."



METALLIC THREAD IN GRINDING WHEELS can be obtained by a new technique developed by Heli-Coil Corp. A stainless steel wire thread insert is coated with cement (Plastibond 229) on the outside only, placed in the grinding wheel, and allowed to harden. The inserts used in this application are manufactured by Heli-Coil with coils in contact with one another to prevent passage of cement to the internal threads. Simple shouldered mandrel is used to press the insert into the grinding wheel.

"Can't teach me anything about shell molding...



but wise foundries can get help from **Plenco"**

Many shell-casting success stories, in recent years, have begun with a preliminary conference between foundry and Plenco. Here, engineers combine a broad experience of shell molding problems with a specialist's knowledge in selecting (or creating) the molding compound that assures the most advantageous solution to the problem. May we consult with you on the use of Plenco-developed, quality resins in your production?

PLENCO PHENOLICS

FOR BETTER PLASTIC PRODUCTS

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Sheboygan, Wisconsin

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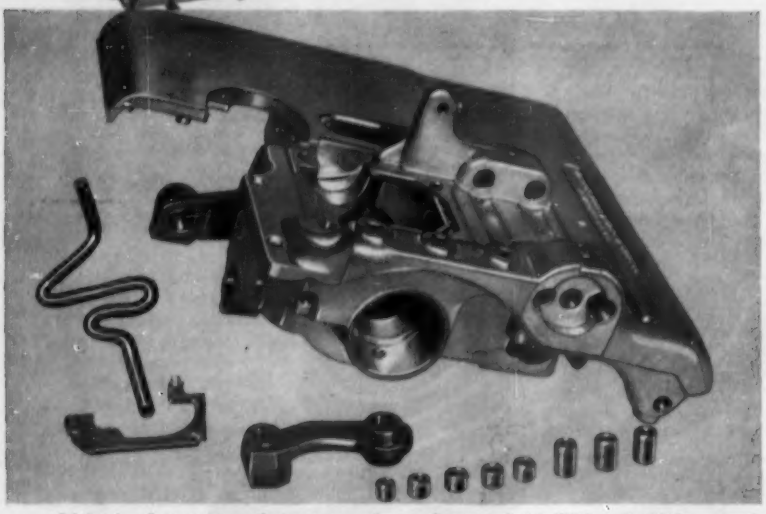
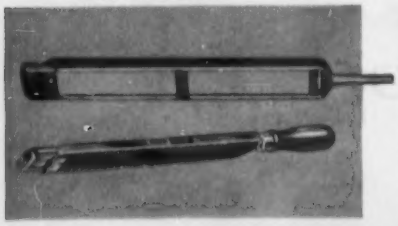
DIE CASTING REPORT

Intricate casting solves tough redesign problem . . . on new HIGH SPEED SEWING MACHINE



Lightning fast starts and stops are only one feature of this Willcox & Gibbs rugged commercial sewing machine which does seaming, hemming, edging and serging operations. High performance is due to progressive design engineering which resulted in a zinc frame die casting (shown above) with 11 inserts, two loose pieces in the die and core pulls in four directions. For over twenty years our engineers have cooperated closely with Willcox & Gibbs Sewing Machine Company, in redesigning this and other castings to achieve lowest possible unit costs consistent with scheduled production.

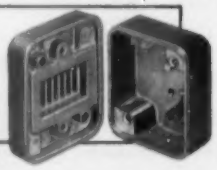


DIE CAST ALUMINUM FRAME ADDS RIGIDITY

The new "Surform" manufactured by the Stanley Tool Division of the Stanley Works is housed in a holder of die cast aluminum. Lightness and rigidity, plus rapid duplication of identical parts with a good smooth surface dictated the selection of the die-casting method.

TV CHANNEL CHANGER

Sonic switch housing for Zenith called for absolute uniformity at reasonable cost. A zinc die-casting provided the answer. Precision, too, does drilling, tapping and honing as part of its integrated service.



The Precision Division is organized to meet all your die-casting requirements. Its integrated facilities include design, engineering, die building, machining, painting, plating and packaging. Try doing business with a firm which offers one contract, one responsibility. We welcome your inquiry.

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CASTING ABOUT

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GREATEST ADVANCE IN 50 YEARS is the way John J. McMullen of the Maritime Administration speaks of the use of gas turbines for marine propulsion. McMullen, chief officer, construction and repair, expressed this opinion recently following extensive tests on the John Sargeant, world's first large merchant ship to be propelled solely by gas turbine.

IN PLACE OF FOUR intricately shaped sheet metal components and a steel pin, requiring eight separate spot welds and a brazing operation (to anchor the pin) Ruby Lighting Corporation has saved time and money by using a one-piece aluminum die casting with the steel pin as an insert. By this method of

American Die Casting Institute

fabrication, high assembly costs and high scrap loss entailed in stamping, have been eliminated. In seeking lower costs, Ruby engineers enlisted the services of a job-shop die caster, where the bracket was redesigned for production as a die casting. Now, no secondary operations are needed prior to painting or electroplating the bracket and placing it in service.

WHEN SHUTTING DOWN any die casting machine, even for short periods, it is important to remember that the machine should be left with the die platens slightly open, according to a recent issue of the Lester Press published by Lester-Phoenix. This basic precaution should be observed because the beams take up heat from the dies while the machine is running. If the machine were left locked, the beams, cooling more rapidly than the dies, would be put under unnecessary stress.

$5400 annual saving

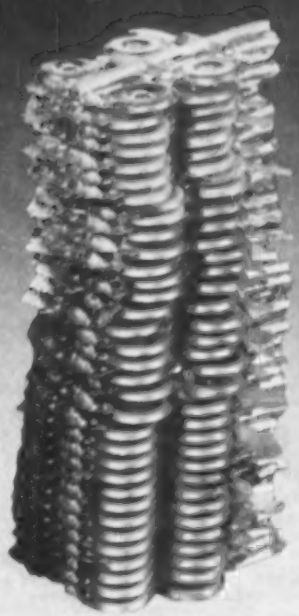
by $4200 investment in ECLIPSE FURNACE

New Double-Chamber Dry-Hearth-Type Metal Melter Proves Flexibility in Small Shop

Increases Production . . . Eliminates Rejects

● The new Eclipse double-chamber dry-hearth-type metal melter—actually a new method—replaced two crucibles and one reverberatory furnace at Le Claire Manufacturing Co., Le Claire, Iowa, and has paid for itself at the rate of $450 a month in savings! The new melter combines advantages of Eclipse direct firing with the first truly separate melting and holding chambers. At Le Claire, the one dry-hearth melter has made this remarkable record supplying all metal for the plant's sand- and die-cast aluminum casting operations. Castings for power mowers, electric and gas motors, as well as many others, are cast from this one furnace. Actually designed for high-production operation, the melter gives even better results in larger foundries.

Pigs are melted on a steep sloping hearth which gives fast run-off of molten metal to the holding chamber. Gassing and agitation of the metal in holding chamber are eliminated because no cold metal enters the bath. Direct firing permits faster, more efficient heating, requires less fuel. All moisture is driven off while metal is melting . . . all oxide inclusions are deposited on surface of hearth where they are easily removed by raking. Hearth and holding chamber are separately heated and controlled for ideal melting and pouring temperatures. And there are more additional quality-improving and cost-saving advantages for your *large or small* operation than can even be suggested here! Write *today* for . . .



Bulletin C-80 ——→

Eclipse®

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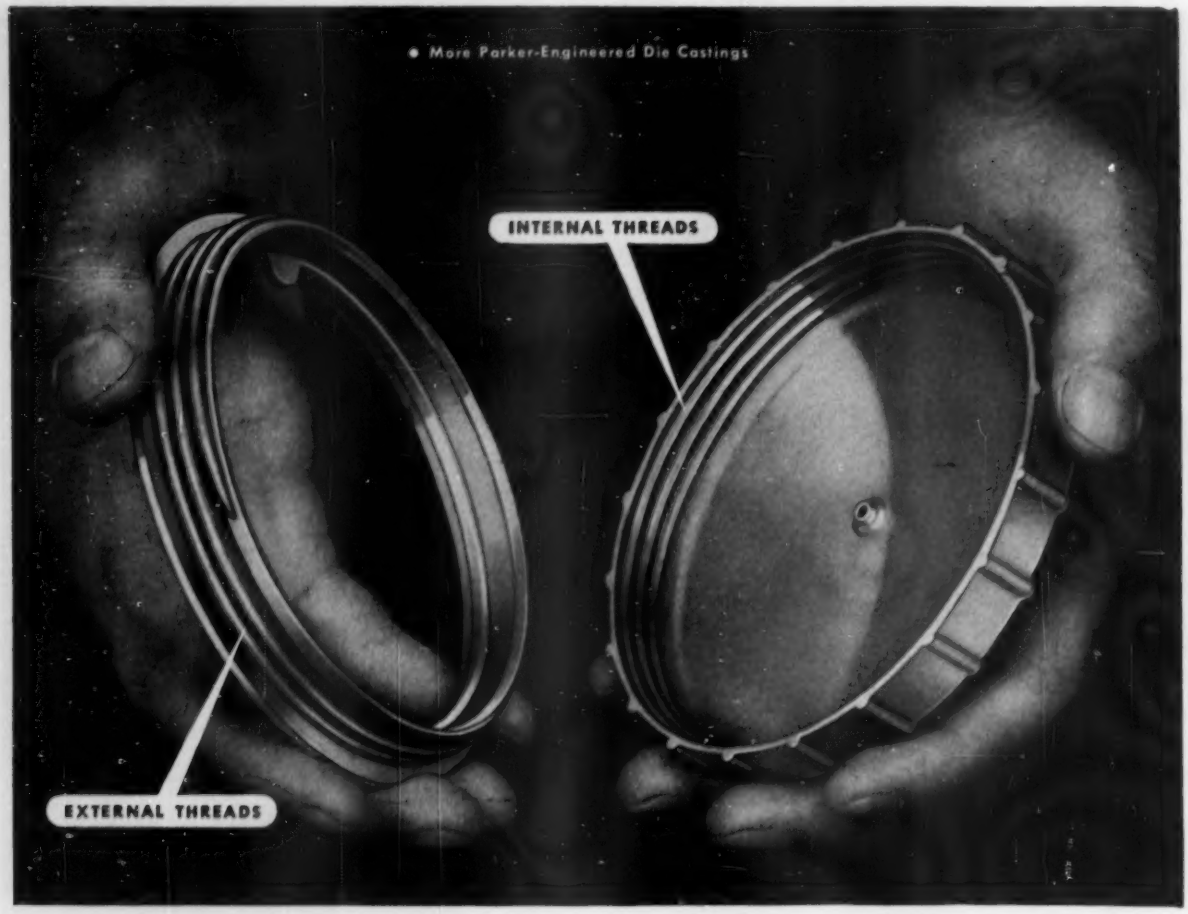

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Hodgson-Geisler Co. • 18917 James Couzens

GIRARD, Penna.
Daniel F. Marsh • 35 Chestnut Street

KIRKWOOD 22, Mo.
Edward F. Higgins, Jr. • 102 West Adams Street

WILTON, Conn.
Girard L. Palmer • Belden Hill Road

SYRACUSE, N. Y.
J. C. Palmer • 712 State Tower Bldg.

BELLEFONTE, Penna.
Warren G. Olson • 420 East Linn Street

These two mating parts, including the threads, are cast simultaneously in the same die. The result—three savings:

1—One die instead of two *saves die cost*

2—Casting two parts at one time in the same die *saves production time*

3—Precision casting of the perfectly mated threads with no parting line *saves machining cost*

Together, these three savings result in a substantially lower cost per piece. Just another example of the way Parker-engineered die castings save you money.

Parker has been a leader in die casting for over 50 years—an old hand with new ideas. This skill and experience can solve problems — and save money—on *your* component parts. Just call the nearest Parker sales engineer or write the factory direct.

Parker White Metal Company • 2153 McKinley Ave., Erie, Pennsylvania

PARKER

high pressure ALUMINUM and ZINC die castings

POWDERED METAL PARTS

For more information circle No. 53 on the Reader Service Card

3 ways Glidden helps you produce better METAL POWDER PARTS

Superior metal powders — Glidden Resistox Metal Powders have been subjected to the most exhaustive tests by parts manufacturers. Result: parts made from Glidden metal powders are judged superior to parts produced from other powders. They permit faster production, with greatly improved finish, appearance and performance characteristics.

Complete field service and lab facilities — Whether you are interested in establishing a new metal powder parts department, or desire to improve operations of an existing department, Glidden can help you. The Glidden metal powders lab and the services of Glidden technicians are available to your metallurgists at any time.

World's largest blender — Glidden can produce up to 30,000 pounds of powder in one batch, more than any other producer... an important factor in complete uniformity of mass-produced parts.

A thorough examination of the manufacturing methods you are now using may lead to substantial savings. Make certain you are not passing up the economies, speedier fabrication and superior parts performance you can get by using Glidden Resistox Metal Powders. Write for complete details.

THE GLIDDEN COMPANY

Chemicals — Pigments — Metals Division

Baltimore, Md. • Collinsville, Ill.
Hammond, Ind. • Scranton, Pa.

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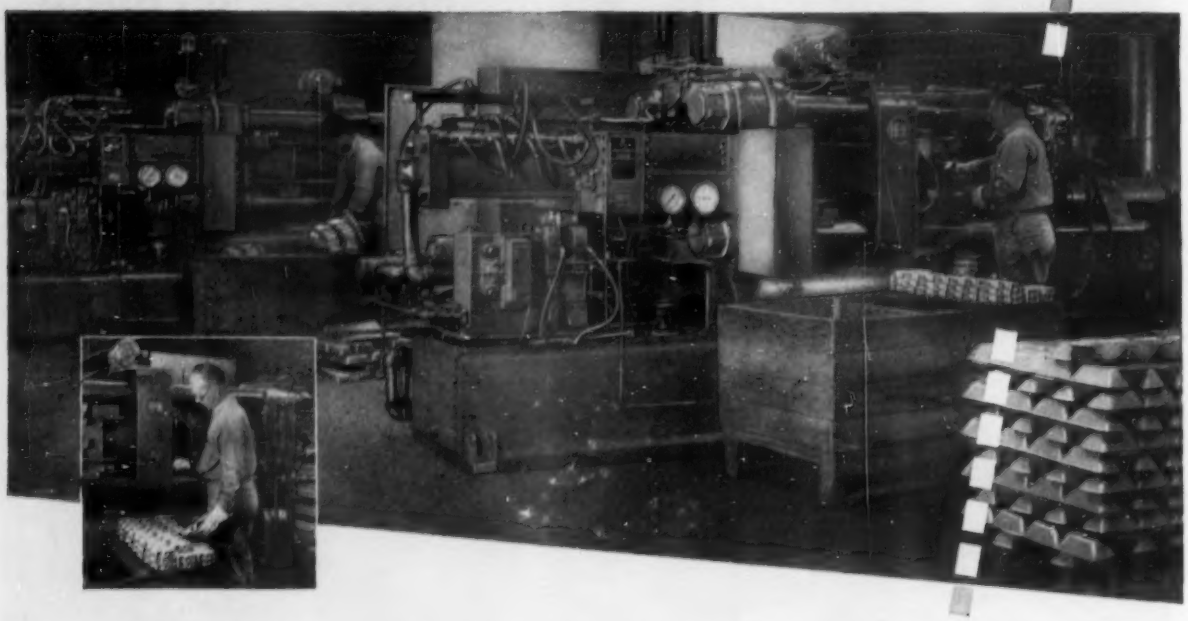
PRESSURE-TIGHT CASTINGS

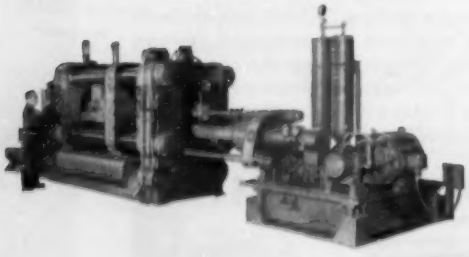


H-P-M Die Casting Machine "Locks Up Tight" For Valve Bodies of Consistent Density

When this H-P-M Die Casting Machine closes the two-cavity mold and metal is shot into intricate dies, each having cores on full three sides, the superior features of H-P-M's mechanical link wedge closing mechanism are convincingly tested. Mr. W. L. Chapman, President of The W. L. Chapman Co., Pasadena, Calif., one of the West Coast's most rapidly expanding die casting operations, says:

"These valve bodies have intricate coring detail on all sides and it takes a machine that locks up tight to produce leakproof, pressure-tight castings. One by one we are replacing all machines in our shop with H-P-Ms. We have two in operation and another on order."

Have you investigated thoroughly the production advantages of the new H-P-M Die Casting Machines? You won't have to pass up the tough jobs. Put them on an H-P-M . . . profitably!



If you have a tendency to back away from the tough ones, take a look at the new H-P-Ms. They're built to produce to the most exacting demands of you or your customer.

HPM

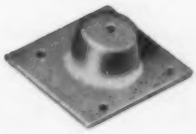
THE HYDRAULIC PRESS MFG. CO.

Mount Gilead, Ohio, U.S.A.

A DIVISION OF KOEHRING COMPANY

For more information circle No. 35 on the Reader Service Card

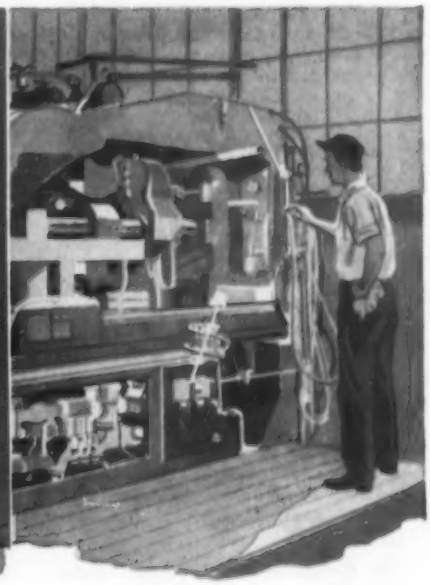
What's *your* need in DIE CASTINGS



WHATEVER YOUR NEED . . . CALL ON

Bendix Foundries

for better quality and faster service



No matter how complicated your die castings are . . . no matter what their size or shape . . . chances are that you can get better quality and faster service by dealing with us.

You save time and money with Bendix Foundries. We have a quarter century of specialized experience in the production of high-precision castings . . . of *all* magnesium and aluminum alloys.

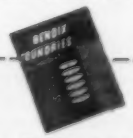
You get what you want with Bendix Foundries. We utilize the most advanced service, methods and equipment . . . including resident government inspectors and complete metallurgical and X-ray laboratories.

If ability to produce quality castings in a wide range of sizes, shapes and varieties . . . and in production or made-to-order lots . . . interests you, see us. BENDIX FOUNDRIES, BENDIX AVIATION CORPORATION, TETERBORO, N. J.

West Coast Office: 117 E. Providencia, Burbank, Calif.
Export Sales and Service: Bendix International Division, 205 E. 42nd St., New York 17, N. Y.

Check-Chart Shows Versatility of Bendix Foundries

PROCESS USED	METAL WORKED	
	ALUMINUM	MAGNESIUM
Sand	V	V
Plaster	V	V
Shell Mold	V	V
Die	V	V
Permanent Mold	V	V



FREE!

Please send your 24-page booklet, Bendix Foundries, describing the advantages of your magnesium and aluminum castings.

Name_____
Title_____
Company_____
Street_____
City_____ Zone_____
State_____

BENDIX FOUNDRIES

Bendix AVIATION CORPORATION

For more information circle No. 18 on the Reader Service Card

DATA OFFERED IN THIS MONTH'S ADS

the Reader Service Cards on the facing page will get you these free reference materials. Circle the numbers and mail.

1. **1,000 shots per Hour**—can be produced, according to bulletin A-10, an engineering report on small die casting machines, from ABC Die Casting Machine Co.

2. **Refax Pots**—A free catalog is offered by ACF Industries Inc. describing the line of "Refax" cast iron melting pots.

4. **Colloidal Dispersions**—for casting are described in Bulletin 425 from Acheson Colloids Co. The bulletin tells how the use of 'dag' dispersions can improve die casting production.

6. **Alloy Metal Powders**—The use of these powders in the fabrication of parts, and the properties of these parts, are covered in detailed reports from Alloy Metal Powders, Inc.

8. **Low Cost, High Speed**—die casting machines are described and all specifications given in a folder from the American Die Casting Machinery Co.

13. **Powder Metal Presses**—in four available sizes are described in technical data from Dorst Div. of Arnhold Ceramics, Inc.

14. **Complete Specifications**—on the different models of die casting machines now being built are offered in literature from B & T Machinery Co.

16. **Aluminum, Magnesium**—castings by five processes are described in a 24-page booklet offered by Bendix Foundries. Advantages of each type of casting in these alloys are covered.

18. **Alloy Information**—A new bulletin from Cannon-Muskegon Corp. gives complete information on their vacuum-melted alloys of iron, nickel, and cobalt as well as special alloys.

19. **Safety Hydraulic Fluids**—A new booklet from Carbide & Carbon Chemicals Co., Form 40134, gives the facts on the company's two new fire-resistant, water-base hydraulic fluids.

21. **Fire Resistant Fluids**—Complete technical data including physical and chemical properties as well as suggestions on uses and tips on system conversion are available from the Celanese Corp.

23. **Die Casting Machine**—Factual information on The Cleveland Automatic Machine Co.'s new 600-ton Universal hydraulic die casting machine is available in Bulletin 600.

25. **Investment Casting**—Important features of their Accumet process for producing stainless steel investment castings are presented in a new folder from Crucible Steel Co. of America.

27. **Sprue Bushings & Spreaders**—Complete specification sheets giving all the uses and advantages of specially designed sprue spreaders are available from Detroit Molding Engineering Co.

29. **Saves $5400**—Bulletin C-80 from Eclipse Fuel Engineering describes a new double-chamber dry-hearth-type metal melter for aluminum. Quality-improving and cost-saving advantages for both large and small operations are described.

31. **Improved Metal Powders**—"Resistox" metal powders, said to produce superior bushings and structural parts are completely described in detailed reports from Glidden Co.

32. **Die Casting with Zinc**—A pocket guide book on die casting the zinc base alloys has been prepared by Henning Bros. & Smith, Inc. This 31 page book contains a wealth of information for the die caster.

40. **Design Information**—Literature and design information is available from Litemetal Dicast, Inc. on magnesium and aluminum alloy die castings.

47. **Standard Bearings**—National Molded Products, Inc. has issued a listing of standard size bushings and bearings carried in stock. Sizes, load data, etc. are given.

49. **Zinc Die Castings**—A brochure issued by New Jersey Zinc Co. discusses manufacturing design problems that can be solved by the use of zinc die castings.

50. **Iron Powders**—Complete data on the properties of 10 grades of iron powder are offered by the Plastic Metals Div. of National-U.S. Radiator Corp. Lubricant, graphite, hardening metals and alloys have been added to control properties.

52. **Die Casting Facilities**—A new brochure has been prepared by the Paramount Die Casting Co. which describes the facilities of the company to make all sorts of die castings and shows some of the many different castings they have made.

55. **Stainless Steel Plunger Rings**—A special bulletin has been released by Precision Piston Rings, Inc. on the properties and advantages of their stainless steel plunger rings.

57. **Performance & Capacity**—of their line of die casting machines are described in literature from Reed-Prentice. Complete details and specifications are given.

58. **Powdered Metal Parts**—in a range of metals are illustrated in a folder from Reese Metal Products Corp., showing their powder metallurgy facilities.

59. **Iron Powder**—A completely new booklet has been prepared by the Republic Steel Corp. giving the composition, physical tests and an evaluation of physical tests and testing. The booklet is a complete description of this company's iron powders.

60. **Heat Control**—Bulletin 1.1K5 from the Ross Heat Exchanger Div. of American-Standard gives detailed information on the Ross Exchanger way of safeguarding hydraulic systems from overheating dangers.

Continued on page 18

PMM AT YOUR SERVICE

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ADVERTISEMENTS—a showcase of the latest in components, equipment and techniques.

NEW PRODUCTS — brief descriptions of significant new production and processing aids.

USEFUL LITERATURE — offerings of new catalogs, data books and other valuable reference materials.

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P 1

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Name _____ Position _____

Name _____ Position _____

Company _____

Address _____

_____

Major Products made at this address: _____

THIS PLANT PRODUCES TYPES OF PARTS CHECKED BELOW:

- ☐ Die Castings
- ☐ Investment Castings
- ☐ Powder Metal Parts
- ☐ Permanent Mold Castings
- ☐ Plaster Mold Castings
- ☐ Shell Mold Castings
- ☐ None of these

Please type or print clearly — DECEMBER, 1956 do not use after 3-15-57

Name _____ *Position* _____

Company _____ *Kind of Business* _____

Street _____

City _____ *Zone* _____ *State* _____

Please send me information and literature on items circled below.

1	18	35	52	69	86	103	120	137	154	171	188	205	222	239	256	273	290
2	19	36	53	70	87	104	121	138	155	172	189	206	223	240	257	274	291
3	20	37	54	71	88	105	122	139	156	173	190	207	224	241	258	275	292
4	21	38	55	72	89	106	123	140	157	174	191	208	225	242	259	276	293
5	22	39	56	73	90	107	124	141	158	175	192	209	226	243	260	277	294
6	23	40	57	74	91	108	125	142	159	176	193	210	227	244	261	278	295
7	24	41	58	75	92	109	126	143	160	177	194	211	228	245	262	279	296
8	25	42	59	76	93	110	127	144	161	178	195	212	229	246	263	280	297
9	26	43	60	77	94	111	128	145	162	179	196	213	230	247	264	281	298
10	27	44	61	78	95	112	129	146	163	180	197	214	231	248	265	282	299
11	28	45	62	79	96	113	130	147	164	181	198	215	232	249	266	283	300
12	29	46	63	80	97	114	131	148	165	182	199	216	233	250	267	284	301
13	30	47	64	81	98	115	132	149	166	183	200	217	234	251	268	285	302
14	31	48	65	82	99	116	133	150	167	184	201	218	235	252	269	286	303
15	32	49	66	83	100	117	134	151	168	185	202	219	236	253	270	287	304
16	33	50	67	84	101	118	135	152	169	186	203	220	237	254	271	288	305
17	34	51	68	85	102	119	136	153	170	187	204	221	238	255	272	289	306

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3	20	37	54	71	88	105	122	139	156	173	190	207	224	241	258	275	292
4	21	38	55	72	89	106	123	140	157	174	191	208	225	242	259	276	293
5	22	39	56	73	90	107	124	141	158	175	192	209	226	243	260	277	294
6	23	40	57	74	91	108	125	142	159	176	193	210	227	244	261	278	295
7	24	41	58	75	92	109	126	143	160	177	194	211	228	245	262	279	296
8	25	42	59	76	93	110	127	144	161	178	195	212	229	246	263	280	297
9	26	43	60	77	94	111	128	145	162	179	196	213	230	247	264	281	298
10	27	44	61	78	95	112	129	146	163	180	197	214	231	248	265	282	299
11	28	45	62	79	96	113	130	147	164	181	198	215	232	249	266	283	300
12	29	46	63	80	97	114	131	148	165	182	199	216	233	250	267	284	301
13	30	47	64	81	98	115	132	149	166	183	200	217	234	251	268	285	302
14	31	48	65	82	99	116	133	150	167	184	201	218	235	252	269	286	303
15	32	49	66	83	100	117	134	151	168	185	202	219	236	253	270	287	304
16	33	50	67	84	101	118	135	152	169	186	203	220	237	254	271	288	305
17	34	51	68	85	102	119	136	153	170	187	204	221	238	255	272	289	306

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Molding

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These two Reader Service cards will bring you copies of any literature offered or described in this issue. To use them:

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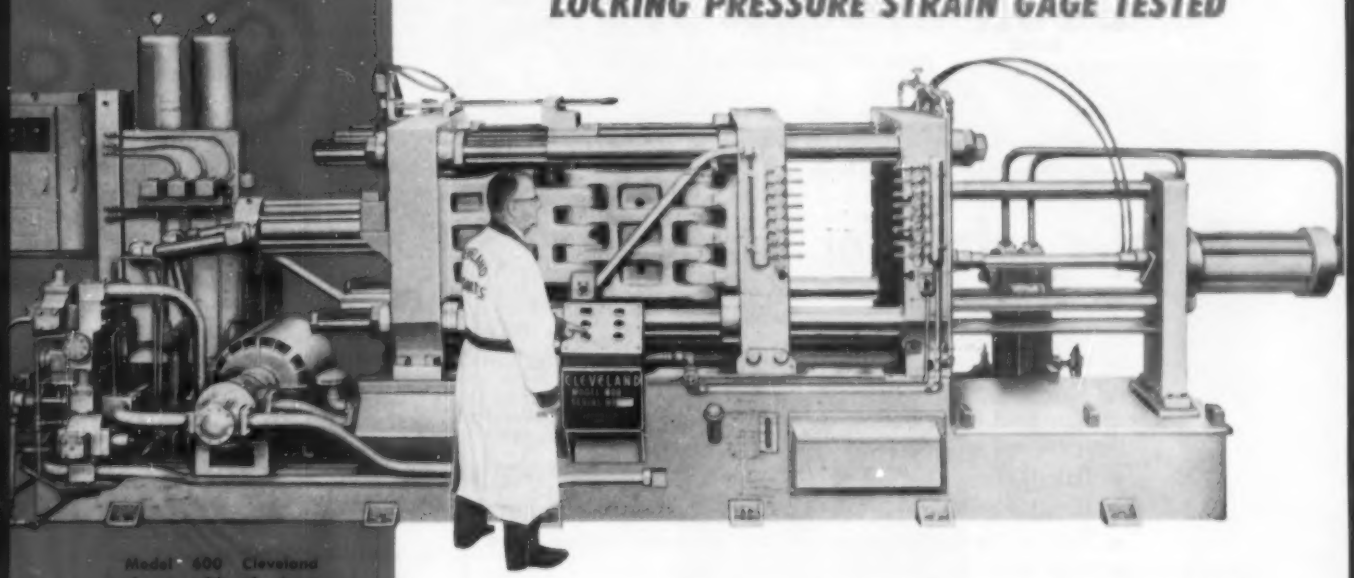
MODEL 600 GREATEST CLEVELAND YET!

New 600-Ton Universal Hydraulic Die Casting Machine

LOCKING PRESSURE STRAIN GAGE TESTED



Model 600 Cleveland shown with aluminum shot end. Also available as a hot chamber machine. Has 46½" x 46" die plates; 28" x 28" space between tie bars; 30" max.—10" min. die thickness; 8" - 15" die opening.

You're looking at the finest 600-ton die casting machine available today! The new Model 600 Cleveland was designed in every detail to give the die casting industry a machine of exceptional performance capabilities . . . high speed, reliable operation . . . safe and simple control . . . minimum maintenance. The developed machine more than met these specifications.

This new Cleveland will deliver castings weighing up to 10 lbs. aluminum, 25 lbs. zinc. An idea of the brawn built into the design—to back up its guaranteed 600-ton locking pressure—is indicated by the 38,000 lbs. net weight of the cold chamber machine shown above. Massive toggle system, 5" dia. tie bars and cross head guide bars, 7¾" thick platens, insure rigidity and accurate die alignment.

The hydraulic system is practically as leak-proof as can be built. Manifold valving is incorporated. Total pump capacity is 99 gpm. A 200 gal. oil reservoir is provided. Filter capacity is twice pump capacity. Two accumulators provide high injection speed.

Dozens of other highly important features—many are exclusively Cleveland's—are incorporated. You'll want to call in a Cleveland sales engineer for full details. In the meantime, factual information, well illustrated, in Bulletin 600 will give you plenty of incentive to reserve floor space for this new Cleveland in your shop. Write now for your copy.

Write for Bulletin 600

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4952 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • S. ORANGE

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

For more information circle No. 23 on the Reader Service Card

There's safety in these NEW numbers

UCON BRAND Hydrolube 150-CP

(Viscosity—approx. 150 S.U.S. at 100° F.)

UCON BRAND Hydrolube 275-CP

(Viscosity—approx. 275 S.U.S. at 100° F.)

Yes, there's safety in these two new grades of UCON Hydrolubes —CARBIDE's safety hydraulic fluids.

Greater safety for machines

These new UCON "CP" Hydrolubes...

- Contain improved liquid and vapor phase corrosion inhibitors for the common metals.
- Have good lubricity. Special anti-wear agents provide improved pump life and performance characteristics.
- Have high viscosity indexes—150 to 160.
- Have low pour points—can be used at sub-zero temperatures.
- Have no harmful effects on packings and seals. Leakage losses are often lower than with other hydraulic fluids.
- And, are made in the two standard viscosity grades—others can be supplied to fit specific requirements.

Safety for men and property

- The resistance of UCON Hydrolubes to burning has been proved by years of exhaustive testing in the laboratory and, by more than 8 years of practical application under standard industrial conditions. UCON Hydrolubes are water-base hydraulic fluids—the water content is the key to their fire-resistance.
- And, for all practical hydraulic purposes, UCON Hydrolubes are non-toxic to workmen.

For safety's sake, get all the facts. Write *today* for the new booklet, "UCON Hydrolubes Spell Safety," Form 40134.

CARBIDE AND CARBON CHEMICALS

CARBIDE AND CARBON CHEMICALS COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.

"Ucon" is a registered trade-mark of Union Carbide.

For more information circle No. 19 on the Reader Service Card

DATA IN ADS

continued from page 16

62. **Stainless Steel Ladles**—and skimmers for non-ferrous metals are listed in data from Spincraft, Inc. Sizes in stock and prices are also included.

64. **Die Casting Machines**—Catalogs containing complete specifications and descriptions of the many machines made for both hot and cold chamber work are available from A. Triulzi.

68. **Pilot or Production Casting**—In bulletin DB-52-500, Westinghouse Electric Corp. discusses the facilities for pilot plant or production casting and prototype manufacture in the new metals plant by investment casting, shell mold or powder metallurgy.

71. **Zinc Plate Coating**—Data sheets and prices are available from The Chemical Corp. on their new "Luster-on 52" single-dip, no-leach conversion coating for zinc plated surfaces.

72. **Metal Brightener**—Engineering reports and technical data on Kenvert 16, a one dip brightener, are available from the Conversion Chemical Co.

73. **Barrel Finishing**—equipment, supplies and abrasives are listed in the complete catalog from Esbec Barrel Finishing Corp.

76. **Abrasive Belt Machines**—Grinding, polishing, and deburring economy is said to be possible with the company's abrasive belt machines. A catalog on these machines can be obtained by enclosing your company letterhead with the advertisement from Hammond Machinery Builders, Inc.

79. **Metal Cleaning**—Oakite Products, Inc. has issued a booklet on metal cleaning entitled "Some Good Things to Know about Metal Cleaning."

80. **Magnesium Dust Control**—The "wet method" of magnesium dust collection and control is the best, according to a new brochure from Peters-Dalton, Inc.

81. **Precious Metals**—Descriptive literature and technical data are available from Sel-Rex Precious Metals, Inc. on industrial applications of precious metals such as gold, rhodium and silver.

82. **Filtration Guide**—Better, faster, cost-cutting filtration is described in a booklet issued by the Sel-Rex Filter Div. of Bart-Messing Corp. It is entitled "Guide to Better Filtration."

"To Err is Human"...

GUSTAV NYSELIUS
President
43 years

LEWIS HELD
Vice President
21 years

THOMAS J. WALKER
Controller & Secretary
21 years

HANS HANSON
Die Room Supervisor
40 years

VINCENT SARACCO
Eng. Asst. to V. P.
15 years

GEORGE NEWBERG
Tool Room Supervisor
32 years

– but when we've made mistakes at Mt. Vernon, it's the customer who benefits

If there lives a man who has never made a mistake—it's because he has never had the courage to try anything new.

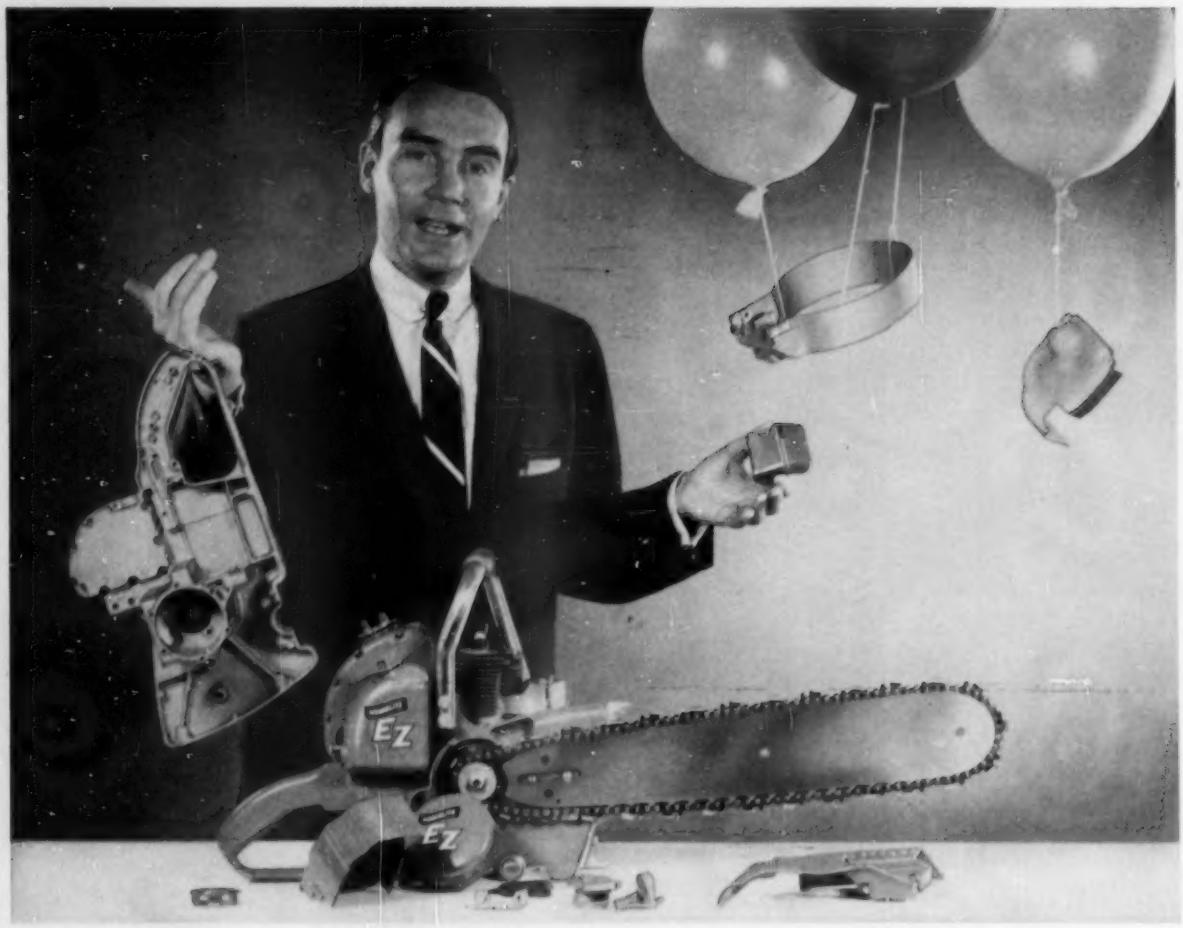
The 6 men pictured here are the men to whom you entrust your work when you hire Mt. Vernon to do it. The total of their experience in die casting adds up to 172 years.

Each of them is exceedingly human—and each of them would be the first to admit that he has made some mistakes. But in doing so, he has learned better ways of giving you ever finer die casting, at ever lower cost to you.

It is these men's perpetual discontent with doing things the accepted way, the "good-enough" way, that has gained for Mt. Vernon the enviable name that we have today. It is because they *have* made some mistakes—and because *you* have profited by them—that the firm which in 1905 started in a modest 2 story building (inset) has grown into this complete and completely modern die casting plant occupying 200,000 square feet.

MT. VERNON
DIE CASTING CORP.
STAMFORD, CONNECTICUT

For more information circle No. 45 on the Reader Service Card



"So light, toy balloons can lift them . . ."

Bantam-weight Doehler-Jarvis Homelite pack 5 horsepower

The gasoline-engine-driven EZ is an eager little beaver . . . whips through an 18-inch pine in 14 seconds, an 8-inch oak in 5.

This just shows that magnesium die castings are the lightest of light.

And they are amazingly strong.

With these particular Doehler-Jarvis magnesium die-castings, for example, Homelite (division of Textron Inc.) packs 5 horsepower into their heavy-duty EZ direct drive chain saw and still keeps weight down to 19 pounds.

Design aids lightness, too

This sales-building lightness and strength is not based solely on the use of magnesium. Homelite and Doehler-Jarvis engineers also eliminate practically all excess metal. They do this by taking advantage of minimum thickness die-cast sections. Ribs provide rigidity.

They do away with much machining, too. And cast in several competitive advantages. For example:

- Die casting establishes accurate machining base points. These permit multi-jig production and both improve

magnesium die castings help into this 19-pound chain saw

dimensional accuracy and reduce cost.

- Servicing instructions in bas-relief are die-cast right into certain parts.

What's more, Doehler-Jarvis delivers the raw parts with near perfect "as cast" surfaces... surfaces that need only degreasing to accept a high-quality finish.

PA reports outstanding service

EZ sales got off the ground fast. Within weeks Homelite needed twice the projected quantity of castings. With a separate plant at Batavia, N. Y. for producing magnesium die castings, Doehler-Jarvis was able to respond quickly. Says Homelite's Purchasing Agent, "Those fellows out in Batavia have certainly done an outstanding job for us."

And you can be sure that Doehler-Jarvis *does* do outstanding work. Right now we're operating some 20,000 dies for some 1400 firms. Call us in on *your* next job.

Doehler-Jarvis

DIVISION OF NATIONAL LEAD COMPANY

General Offices: Toledo 1, Ohio

In Canada:

Barber Die Casting Co. Limited

Hamilton, Ontario

For more information circle No. 46 on the Reader Service Card

Paramount

YOUR BEST SOURCE

Flexibility

. . . a by-word with PARAMOUNT

Large castings, small castings, varied shapes and sizes . . . thin walls, combining strength and rigidity . . . close tolerances that eliminate machining — are every day routine at PARAMOUNT.

Our designers, sales engineers, plus modern tooling and production facilities are available for your complete die casting requirements.

WRITE FOR FREE DESCRIPTIVE BROCHURE

ALUMINUM ZINC MAGNESIUM

Paramount DIE CASTING COMPANY

ST. JOSEPH 22, MICHIGAN

Circle No. 52 on the Reader Service Card

BETWEEN THE LINES

the editor's viewpoint on articles in current and forthcoming issues

IF IT'S COLOR YOU WANT to dress up your zinc or aluminum die castings, there's a new solution to your problem. A recently announced process for applying color directly over a chromate-coated die casting is described in detail beginning on page 51. It's non-electrolytic, low cost, and reported to be highly satisfactory. In addition, the chromate coating provides extra protection against corrosion. With all the interest in color anodizing today, we think you'll also want to have a look at this alternative coloring technique.

STAINLESS STEEL POWDER has many desirable attributes . . . but also presents some manufacturing difficulties. One advance in the processing techniques that may simplify sintering and hence, encourage further usage of stainless steel powders is reported on pages 44 and 45 of this issue. Work with Inconel muffles promises to have many advantages.

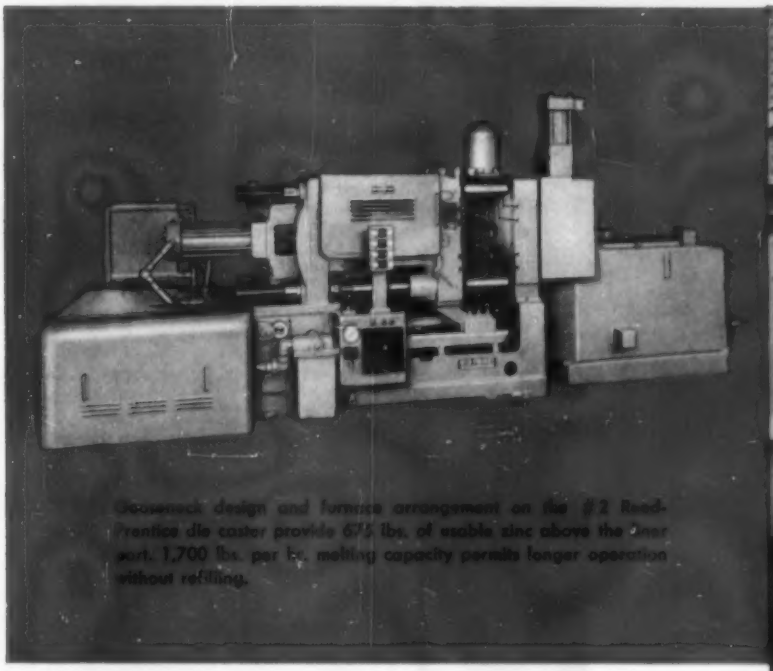
NEXT TO AUTOMOBILES, the biggest load of die castings is being toted by household appliances. Your refrigerator, washer, vacuum cleaner, garbage disposer and other domestic gadgets accounted for 152,500,000 pounds of zinc and aluminum die castings last year. Some of the places they were used are indicated beginning on page 35.

ALUMINUM POWDER METALLURGY has had great impetus during recent years, and is now reaching production. It seems appropriate to give a complete guide to aluminum powder metallurgy now, and we have obtained a paper by one of the pioneers in the field, Dr. R. Irmann of Switzerland. He has charted for you all of the important physical properties, described in detail the design characteristics, and shown illustrations of some European applications such as impellers for hot air circulation, compressor blades, pistons, manhole covers, etc. It will be a feature of PMM in January.

EVERY MAIL brings us more requests for our forthcoming First Annual Directory of Die Casters which will be the central item in our big January issue. Judging by the interest in this project, there has long been need for a buyers' guide of this type. You had better make plans to get and hide your copy when it arrives in the mail because many people in your plant will be anxious to get it. We're printing some extra copies, too, and hope that we can satisfy all requests.

MORE DESIGN POINTERS will be published in February PMM. So far, helpful hints on preferred design practice have been printed covering die castings and powdered metal parts. Now we have for you a set of suggestions to help in designing investment castings.

Lee Silver Service Chooses REED-PRENTICE Die Casters On PERFORMANCE AND CAPACITY



Gooseneck design and furnace arrangement on the #2 Reed-Prentice die caster provide 675 lbs. of usable zinc above the shot port. 1,700 lbs. per hr. melting capacity permits longer operation without refilling.

President Lee Radke emphasizes cost-cutting operation at Lee Silver Service in producing plated, decorative hardware for autos and electrical appliances.

At Lee Silver Service in Detroit, "hot chamber" Reed-Prentice die casting machines turn out 100% of the zinc parts for an integrated casting-to-plating operation. Mr. Radke lists his main reasons for preferring REEDS as:

- Exceptional control and melting capacity of furnace.
- Low maintenance costs, based on actual records, in comparison with other makes.
- Rugged construction, and ability to produce large castings.
- Excellent performance with use of fire-resistant fluids —no leaks.
- Faster cycles based on competitive comparison.

These features — furnace control and capacity, high performance with low maintenance — all mean lower costs to Lee Silver Service. And Reed-Prentice positive mechanical locking tonnage eliminates all "pressure back-off", produces uniform, porosity-free die castings with a "hardware" finish that cuts rejects and holds down secondary operations.

You can get complete details and specifications on REED die casters by writing Reed-Prentice today.

15" zinc washer ring, weighing 2.61 lbs., and dishwasher control housing, weighing 1.33 lbs., have a porosity-free, "hardware" finish.

REED-PRENTICE

Affiliate of PACKAGE MACHINERY COMPANY

WORCESTER 4, MASS.

BRANCH OFFICES: NEW YORK • CLEVELAND • CHICAGO • BUFFALO • DAYTON • DETROIT • KANSAS CITY • LOS ANGELES REPRESENTATIVE: MINNEAPOLIS — CHAS. W. STONE CO.

For more information circle No. 57 on the Reader Service Card

Westinghouse pilot plant for precision castings speeds development, saves capital investment

Incubator for casting ideas

To help you prove your precision casting ideas and developments under production conditions, Westinghouse invites you to use its new pilot plant facilities at Blairsville, Pa. Thus you can speed your metals programs without heavy capital investment.

Westinghouse will also assist you in creating prototype quantities . . . or give you fast, dependable delivery on production quantities of precision investment castings (lost wax process), shell-mold castings and powder metal parts.

Consider molded metal parts for your product components requiring intricate shapes, close tolerances, difficult machining operations or component assemblies. Westinghouse has skilled metals engineers with broad experience to help show you the way to improved products, lower costs.

Send today for further details and a copy of DB 52-500. Also enclose a photo, drawing or sample of the part you want evaluated. No obligation. Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-05002

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING **TODAY!***

For more information circle No. 88 on the Reader Service Card

PMM PEOPLE

changes & appointments

H. Don Shockley has been appointed rectifier sales engineer for *Hanson-Van Winkle-Munning Co.'s* West Coast district. He will assist the selling and servicing of the company's rectifiers for metal finishing.

Thomas B. Davis and **Jack W. Blanton** have been added to the staff of *NRC Metals Corp.*, a subsidiary of the *National Research Corp.* Mr. Davis was named production superintendent at the Santa Rosa, Fla. plant and Mr. Blanton becomes manager of sales development for NRC Metals.

C. Foster Applegate has been appointed *Frederick Gumm Chemical Co.'s* distributor representative in the east central New York state area.

Hyman Rosenthal has been named director of research for *Arwood Precision Casting Corp.* He will assume responsibility for the control and maintenance of materials quality, improvement of foundry techniques, and the study of new casting processes.

Joseph N. Mamola is in charge of the new Detroit sales office of the *Chemical Div. of Celanese Corp. of America.* The division's newly-opened sales office in Wilmington, Del. is headed by H. B. Bartley Jr., former acting manager for the division's Middle Atlantic sales district.

Thomas G. Digges has been appointed assistant chief of the Metallurgy Division of the *National Bureau of Standards.* A member of the Division for 36 years and acting assistant chief since 1950, Mr. Digges will continue to help direct the bureau's program of metallurgical research and development. He will also remain chief of the Thermal Metallurgy Section.

The appointment of **John G. Schaeffer** as manager of manufacturing at the *Oakland Foundry* has been announced by the *General Metals Corp.* Mr. Schaeffer was formerly foundry superintendent at the company's plant in Vernon, Calif.

Harold C. Wagner has been appointed technical director and **Therald C. Alexander** has been named chief engineer of the *Zirconium Corp. of America.* Mr. Wagner will supervise process engineering and research development, and Mr. Alexander will head the company's plant layout and maintenance sections.

Continued on page 58

PRODUCTION SHORT CUTS
WITH

ZINC
DIE CASTINGS

NUMBER 5 OF A SERIES

▲ Assembly is a simple job with two mounting brackets and dust shield pre-assembled. The ZINC Die Casting becomes a structural member of the cabinet and supports the front glass and tuning controls.

◀ This ZINC Die Casting, designed by Westinghouse for its 1957 line of TV receivers, requires no secondary operations other than a baked electrostatic spray finish. The name and indicator arrow are cast into the frame.

Framing the picture at WESTINGHOUSE

At WESTINGHOUSE, TV designers recognize that *appearance* and *production cost* are just as important as maximum performance to the success of a new line of receivers. To get the utmost in eye-appeal and production economy in the 1957 models, WESTINGHOUSE combined the outer screen frame and the cabinet front in a beautifully designed, one-piece ZINC Die Casting.

How else could the front panel and screen mask be produced complete with mounting studs accurately cast for quick assembly?

How else could the necessary control openings and parts recesses be provided without expensive machining?

How else could you secure a part having more than adequate structural rigidity at a great saving in cost?

What other metal or process could excel ZINC Die Casting in attaining such a clean, satin-smooth finish?

These basic qualities account for the widespread use of ZINC Die Castings in many fields—uses which result in production short cuts to more durable and handsome products. For possible answers to *your* manufacturing design problems, send for our brochure and contact any commercial die casting company.

◀ **Send for your copy.**

The New Jersey Zinc Company, 160 Front Street, New York 38, N. Y.

ZINC
FOR DIE CASTING ALLOYS

The research was done and the Zamak die casting alloys were developed with

HORSE HEAD SPECIAL (99.99 + % Uniform Quality) ZINC

For more information circle No. 49 on the Reader Service Card

pampered powders

PLAST-IRON

B-260 • B-261 • B-210
B-212 • B-213 • B-215

Pampered *by blending and balancing*
with LUBRICANT • GRAPHITE
HARDENING METALS and ALLOYS
to control GROWTH • HARDNESS •
TENSILE STRENGTH
to save TIME of mixing the usual additives
to assure UNIFORMITY
to reduce press operating COSTS

Table below indicates properties powder metallurgy fabricators secure using Grade B-261 Low Cost Reduced Iron Powder

Composition	Modulus of Rupture, PSI	Tensile Strength, PSI	Elongation % in 1"	Hardness, "B"	Green Density, GMS./C.C.	Sintered Density GMS./C.C.	% Growth Radial from Die Dimensions	% Growth Radial from Green Die Dimensions	% Growth Axial
Sintered 10 Minutes at 2050°F									
1. Grade B-261	61,300	37,900	1.0	53.3	6.38	6.30	+ .03	− .09	+ .06
2. Grade B-261 +0.50% Graphite	52,200	33,800	1.3	53.7	6.37	6.14	+ .44	+ .14	+ .36
3. Grade B-261 +0.75% Graphite	56,100	35,100	1.3	56.6	6.36	6.08	+ .61	+ .31	+ .86
4. Grade B-261 +1.00% Graphite	56,000	36,800	1.3	58.9	6.34	6.04	+ .73	+ .43	+ .93
5. Grade B-261 +1.25% Graphite	64,000	38,000	1.2	59.3	6.34	6.01	+ .81	+ .50	+1.07
6. Grade B-261 +1.50% Graphite	56,600	37,900	1.2	57.9	6.31	6.00	+ .80	+ .49	+1.01
7. Grade B-261 +3.00% Copper	74,600	36,100	1.1	51.9	6.22	6.11	+ .76	+ .46	+1.22
8. Grade B-261 +5.00% Copper	83,300	42,300	1.2	56.6	6.24	6.08	+1.07	+ .73	+1.43
9. Grade B-261 +7.00% Copper	87,100	47,600	1.2	60.7	6.26	6.08	+1.09	+ .79	+1.53
10. Grade B-261 +10.00% Copper	95,600	49,300	1.2	59.8	6.29	6.13	+1.04	+ .74	+1.41
Sintered 30 Minutes at 2050°F									
1. Grade B-261	69,000	38,300	1.1	56.0	6.29	6.29	− .23	− .53	− .38
2. Grade B-261 +0.50% Graphite	57,000	37,100	1.1	58.3	6.23	6.13	+ .23	− .06	+ .38
3. Grade B-261 +0.75% Graphite	62,300	37,300	1.2	58.2	6.23	6.08	+ .47	+ .17	+ .63
4. Grade B-261 +1.00% Graphite	63,100	36,600	1.1	59.1	6.24	6.08	+ .57	+ .27	+ .79
5. Grade B-261 +1.25% Graphite	68,200	38,000	1.0	54.3	6.24	6.05	+ .65	+ .35	+ .86
6. Grade B-261 +1.50% Graphite	65,200	41,300	1.3	57.5	6.22	6.02	+ .63	+ .33	+ .86
7. Grade B-261 +3.00% Copper	76,100	42,100	1.1	53.5	6.21	6.08	+ .67	+ .37	+1.13
8. Grade B-261 +5.00% Copper	83,600	41,900	1.1	57.1	6.24	6.08	+ .93	+ .68	+1.30
9. Grade B-261 +7.00% Copper	91,800	47,300	1.1	59.9	6.26	6.07	+1.12	+ .82	+1.56
10. Grade B-261 +10.00% Copper	86,300	48,300	1.1	58.8	6.40	6.12	+1.06	+ .76	+1.18
Sintered 50 Minutes at 2050°F									
1. Grade B-261	75,100	32,300	1.1	59.6	6.39	6.33	− .46	− .77	− .80
2. Grade B-261 +0.50% Graphite	63,900	28,900	1.3	54.5	6.26	6.16	+ .17	− .13	+ .16
3. Grade B-261 +0.75% Graphite	67,600	31,900	1.3	52.2	6.27	6.11	+ .34	+ .04	+ .51
4. Grade B-261 +1.00% Graphite	65,600	33,000	1.2	53.7	6.26	6.09	+ .37	+ .07	+ .62
5. Grade B-261 +1.25% Graphite	75,800	32,500	1.2	61.5	6.25	6.06	+ .47	+ .17	+ .75
6. Grade B-261 +1.50% Graphite	72,000	39,600	1.3	52.2	6.23	6.03	+ .49	+ .18	+ .57
7. Grade B-261 +3.00% Copper	82,000	40,800	1.2	53.9	6.25	6.13	+ .57	+ .27	+ .98
8. Grade B-261 +5.00% Copper	89,300	44,800	1.1	59.5	6.29	6.09	+ .97	+ .65	+1.30
9. Grade B-261 +7.00% Copper	98,300	51,700	1.3	63.3	6.27	6.09	+1.08	+ .78	+1.46
10. Grade B-261 +10.00% Copper	96,200	47,700	1.2	59.7	6.40	6.12	+1.02	+ .72	+1.37

Write for additional data on above listed compacting powders

General Sales Office
342 Madison Avenue, New York 17, N.Y.

District Offices
Chicago • Johnstown, Pa. • Los Angeles

PM PLASTIC METALS

PLASTIC METALS
Division of
National-U.S. Radiator Corporation

For more information circle No. 50 on the Reader Service Card

PMM LETTERS

the reader's forum

LOOKING FOR A PINION

We are interested in having someone, preferably who is alalready tooled, to make us a pinion for a lawn sweep, as follows: 10 pitch, 12 tooth, ⅝" bore, 1⅜" wide approximately and approximately 1¼" to 1-3/16" long. —W.C.C.

If any of our readers have tools for a suitable pinion, we'll be glad to forward the names.—Ed.

MORE DATA?

I was much interested in your excellent article, "Finishes: More Emphasis on Surface Treatments Ahead", in the September issue of PMM.

Based on your survey of some 923 companies, I wondered if it would be possible to obtain a breakdown of the type of base coating material as aluminum, zinc, brass, magnesium, for organic coatings, electroplating, chemical conversion coatings, anodized coatings and vacuum coatings? Also would it be possible to specify a rough ratio of finishing cost to base casting cost for these various finishes?—F.L.B. (Research Engineer)

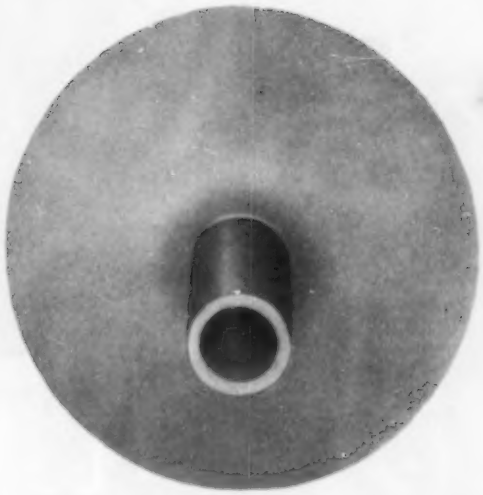
We have tabulated and printed a limited number of folders including the results of the survey we made, and will be glad to forward this to any of our readers. However, the information obtained does not go into as great detail as reader F.L.B. would like.—Ed.

PATENT ON SOLUBLE CORES

Your article in the July 1956 issue of "Precision Metal Molding" entitled "Soluble Cores" has come to our attention. In reading this article, the impression is gained that the method described is one developed by the author's firm.

It is possible that you are not aware of it, but we are the owners of U. S. Patent No. 2,420,-

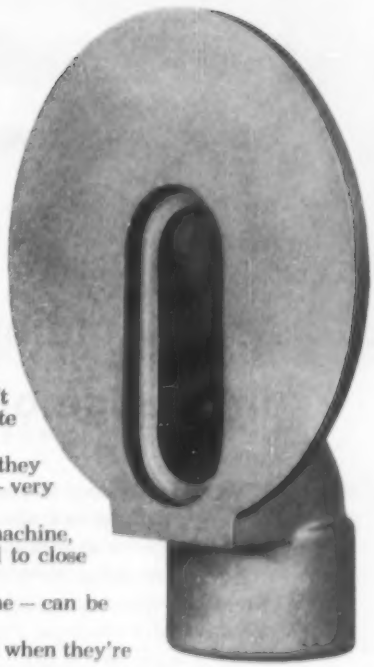
Continued on page 65



from Crucible

Aircraft Quality STAINLESS INVESTMENT CASTINGS

in any shape or grade . . .



Can your product benefit from the important features shown in these Crucible Accumet® precision investment stainless castings? They are tube supports for jet aircraft engine assemblies, but the characteristics they illustrate are just as vital to thousands of other applications.

THIN WALLS — Accurately produced by the Accumet casting process, they are impossible to make in sand or shell mold castings — very difficult to forge.

BLIND HOLES — like this one, are impossible to forge, expensive to machine, and very difficult to sand cast . . . but they can be held to close tolerances by Accumet casting.

CORING — Deep or intricate cores — prohibitively costly to machine — can be economically produced by the Accumet process.

ODD SHAPED PARTS — difficult to chuck and machine, are economical when they're Accumet castings.

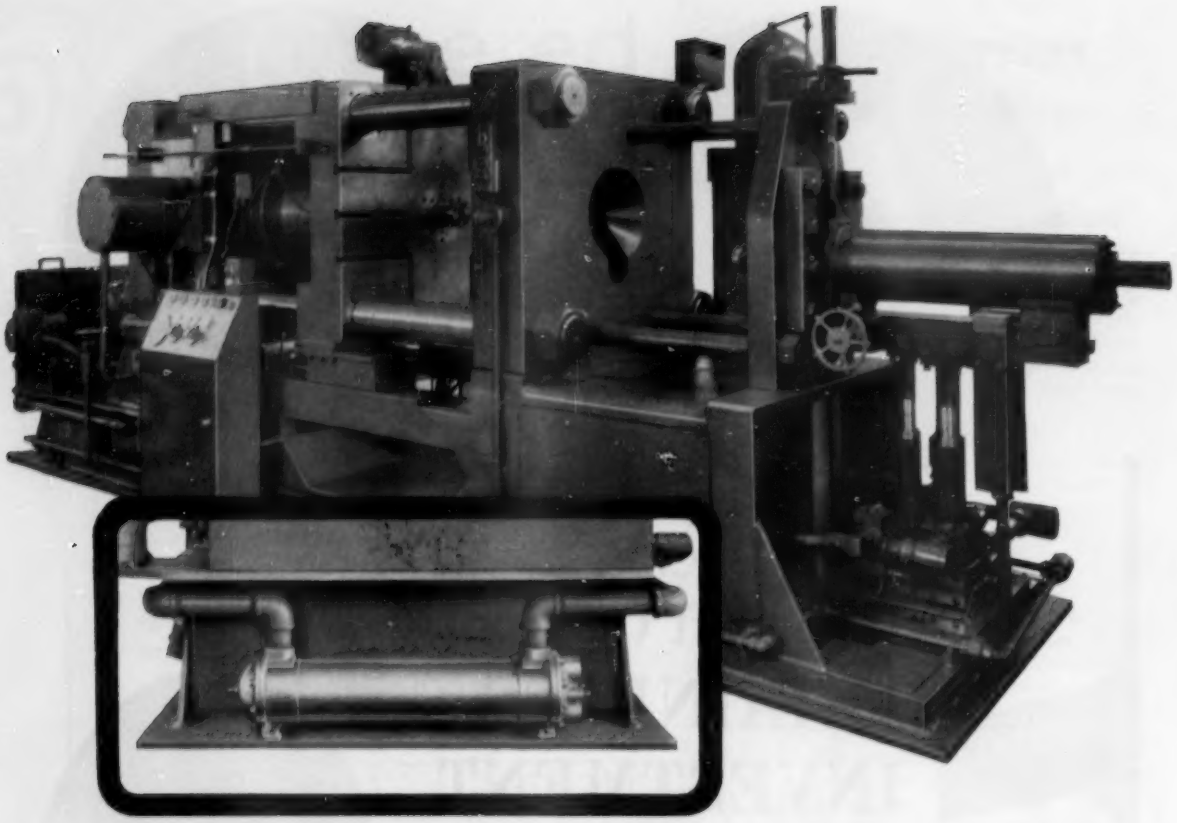
Next time your designs call for parts with intricate shapes . . . close tolerances . . . fine finish . . . high quality and uniformity, make them Crucible Accumet castings. They are available in any grade of steel or high alloy your product calls for. Let a Crucible engineer give you all the facts about how Accumet castings can save you time and money. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

Write for a free copy of the informative folder "Accumet Castings".

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

For more information circle No. 25 on the Reader Service Card



ROSS EXCHANGER

cools oil to maintain "higher, steady pressures" in Wedgelock Die Caster

With a die-locking tonnage of 750, this Wedgelock Die Casting Machine is designed to develop and hold up to 40,000-lb. pressures in the shot plunger without opening the die faces.

By maintaining correct oil temperature, a Ross Type BCF Exchanger insures rated hydraulic power for the production of dense, solid castings. Pump slippage from overheated, thinned oil is prevented.

When a hydraulic system is safeguarded the Ross Exchanger way, it's a sure sign that the machine has been designed with an eye to future performance: In addition to being top-rated for thermal efficiency, Ross Exchangers are ruggedly built to withstand punishing hydraulic shock.

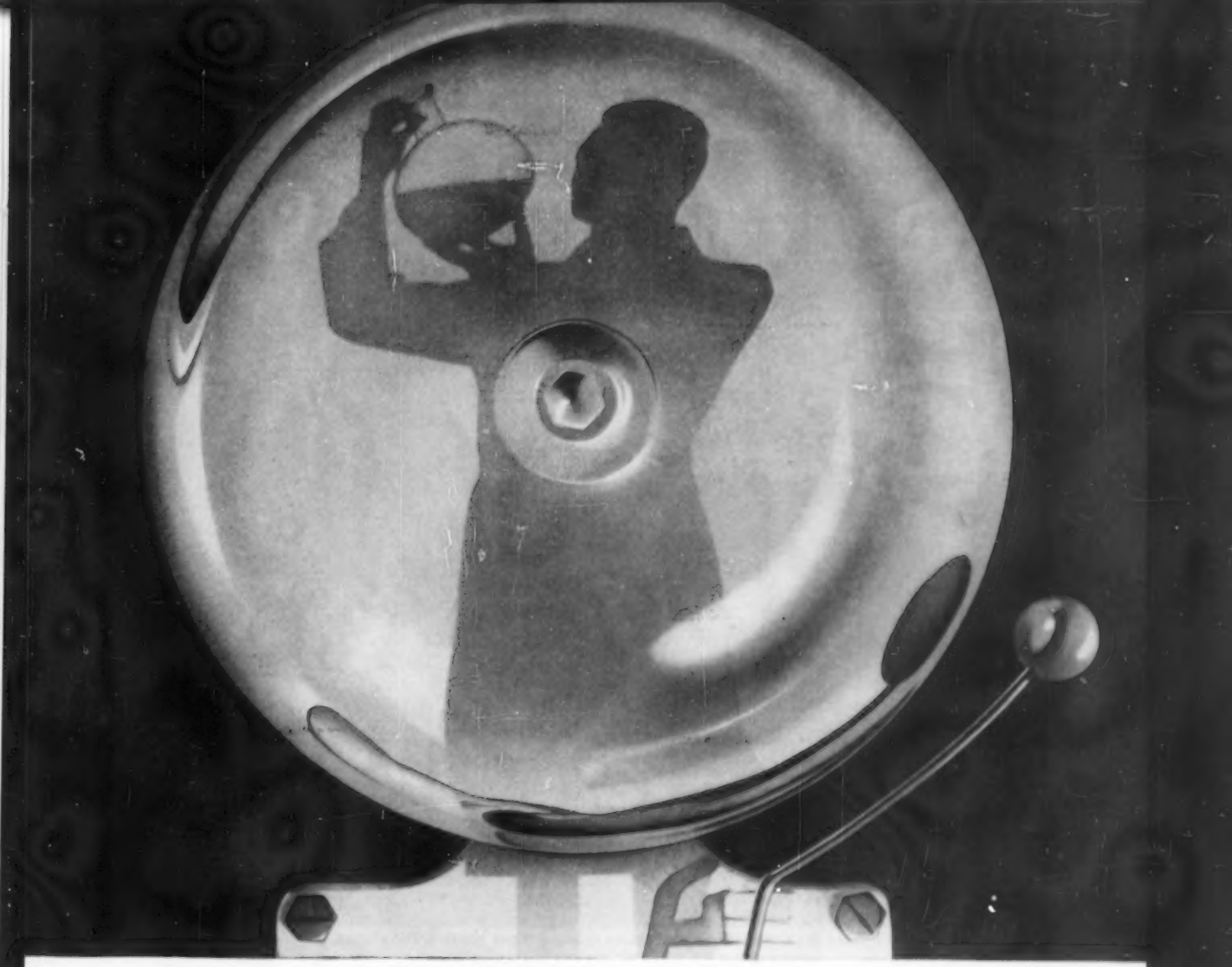
Completely pre-engineered and fully standardized, they're available in a wide range of sizes for use on hydraulic machinery of every description.

For detailed information, request Bulletin 1.1K5. Ross Heat Exchanger Division of American-Standard, Buffalo 5, N.Y. In Canada: American-Standard Products (Canada) Limited, Toronto 5, Ont.

ROSS

ROSS HEAT EXCHANGER PRODUCTS

For more information circle No. 60 on the Reader Service Card



matching wits with fire

Fire-resistant Celanese Cellulubes provide protection against the costly damage of fires and explosions.

When employed as the hydraulic fluid in die casting and similar critical operations, Cellulubes reduce the ever-present danger of uncontrollable fires caused by line breaks or other equipment failures. As air cylinder lubricants in compressed air systems, Cellulubes prevent the formation of excessive carbon deposits—the main source of compressor fires and explosions.

Possessing stable physical properties, Celanese Cellulubes provide high performance and safety during continuous duty under critical conditions. This stability contributes to the fluid's longer life, an economy factor further enhanced by the fluid's reusable property, permitting reuse of spillage. Straight phosphate esters, Cellulubes contain no additives. They're non-reacting, non-carbon-forming, non-corrosive, fire-resistant chemical compounds with excellent lubricity.

Available in 6 controlled viscosities, Cellulubes can be supplied by Celanese to meet exacting requirements in the replacement of flammable fluids presently in use. Play it safe, write for complete data and technical assistance.

Celanese Corporation of America, Chemical Division, Dept. 589-L, 180 Madison Avenue, New York 16, N. Y.

Basic reasons..... **.....for improved products**

Acids
Alcohols
Aldehydes
Anhydrides
Esters

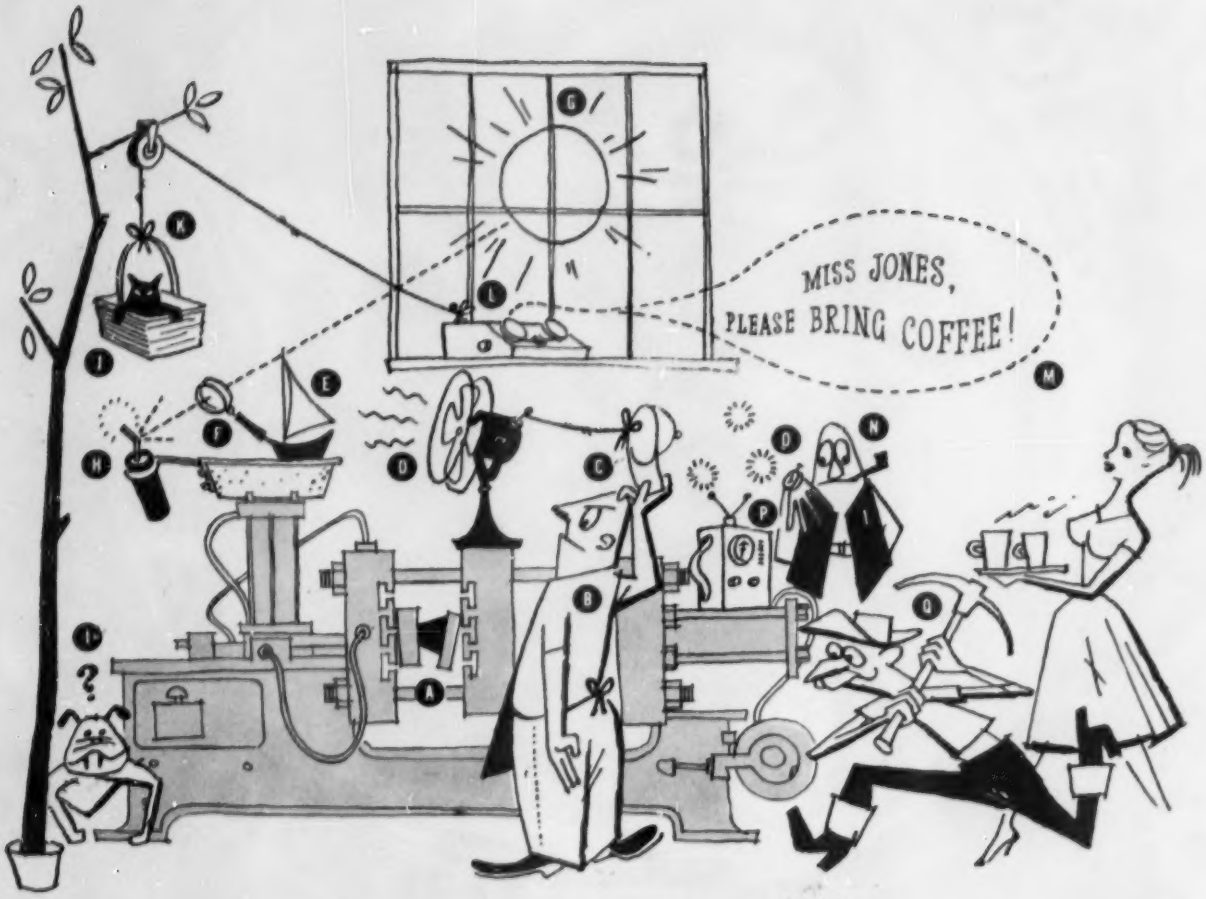
Functional Fluids
Gasoline Additives
Glycols
Ketones
Oxides

Polyols
Plasticizers
Salts
Solvents
Vinyl Monomers

Celanese
CHEMICALS

Agricultural, automotive, aviation, building, electrical, paper, pharmaceutical, plastics, surface coatings, textile.

For more information circle No. 21 on the Reader Service Card



HOW TO REMOVE STUCK CASTINGS—When stuck casting **A** is discovered, operator **B** removes cap **C** in disgust, starting fan **D**. Sailboat **E** moves across water bringing lens **F** in position so sun **G** ignites fuse on firecracker **H**. Explosion scares bulldog **I** who chases cat **J** up fake tree to elevator **K** which starts tape recorder **L** summoning secretary **M**. Foreman **N** sees coffee and checks watch **O** to see if it is coffee break time. Radium dial on watch starts Geiger counter **P** which is heard by old prospector **Q** who removes casting with pick hoping to find uranium.

Prevent stuck castings in the first place with Die Slick. For years Die Slick compounds have solved die casters' most difficult problems . . . sticking, soldering, ejector pin wear, and die damage. And Die Slick solves new problems every day—constant research and on-the-job testing continually prove new grades of Die Slick. What this means to you: if you change alloy or metal, change your type of production, install new equipment . . . there's a grade of Die Slick ready to meet your new requirements! Write today specifying the metal or alloy you are casting and any unusual requirements. We'll recommend the grade to do the job. Try a week's supply. If you aren't satisfied we'll cancel the invoice.

Die Slick is a registered trademark of G. W. Smith & Sons, Inc.

DIE SLICK

used by die casters everywhere

G. W. SMITH & SONS, INC., 5403 KEMP ROAD, DAYTON 3, OHIO

For more information circle No. 61 on the Reader Service Card

NOW IN PRODUCTION...

3 NEW REPUBLIC IRON POWDERS

...WITH Controlled dimensional factor

TYPE "G" TYPE "N" TYPE "S"

To meet the varied requirements of iron powder users, Republic's Metal Powder Division has developed and is producing three new grades of iron powder suitable for the molding and manufacture of mechanical parts.

Each one of these new powders has a variable controlled characteristic known as *Controlled Dimensional Factor*. This term simply means that in the presence of copper, Republic Iron Powder—depending on type—can be made to grow, remain stable, or shrink, within acceptable limits. These new powders have been designated as:

TYPE "G" FOR GROWTH—A powder having a definite growth characteristic in the presence of copper and developed for use in many *existing* dies designed for powder which expands when sintered.

TYPE "N" FOR NORMAL—This powder has been given normal variation in dimensional change from a slight shrinkage to a slight growth, depending upon the end result required.

TYPE "S" FOR SHRINKAGE—A powder with an extremely high shrinkage characteristic which can be used to attain certain tensile strengths with lesser quantities of copper.

Both "S" and "N" powders should prove exceptionally advantageous to parts producers faced with the problem of what to do with dies that have become oversize through wear. Types "S" and "N" make possible the production of parts to original dimensions without the need for extensive or expensive re-working of dies.

Controlled Dimensional Factor is an exclusive Republic development retaining the excellent chemistry and high green strength always associated with Republic Iron Powder.

For complete information on chemical composition, physical properties and test evaluations, write for Republic Booklet Adv. 763.

REPUBLIC STEEL

Metal Powder Division • Toledo 5, Ohio

GENERAL OFFICES • CLEVELAND 1, OHIO

For more information circle No. 59 on the Reader Service Card

Cannon-Muskegon protects your product's quality . . .

because MASTERMET alloys more than meet your most exact specifications

MASTERMET alloys are premium materials compounded to improve your product . . . *at no extra cost.* Alloys are made from *prime materials only* . . . then alloyed under exact time and temperature control. The latest degasification methods assure a clean, sound product.

What's more, MasterMet alloys are made to *compensate for your melting losses* . . . their chemistry meets all similar specifications.

Finally, Cannon-Muskegon *cleans* alloy of surface oxidation . . . which means less trouble for you. And with each lot you get *certification* of exact chemistry — there's no guesswork. In addition, MasterMet alloys are packed in easy-to-handle, clearly marked containers to simplify selection and storage.

But MasterMet alloy service is not over until the casting has left your shop. Cannon-Muskegon offers expert consultation service to assist you in improving your processing methods and, ultimately, your product.

Next time, call Cannon-Muskegon for your alloy needs — you'll be glad you did!

NOW . . . UltraMet VACUUM-MELTED ALLOYS

Cannon-Muskegon now offers vacuum-melting facilities for the production of iron-, nickel- and cobalt-base alloys up to temperatures of 3100°F . . . and special alloys for industry . . . in ingots or cast billets. We are ready to provide cleaner, stronger and more ductile alloys for remelt . . . sample development and production of vacuum process castings . . . and cast ingots for forging, extruding or machining.

Get complete information on MasterMet and UltraMet alloys and services . . . write for New Bulletin.

MasterMet ALLOYS AVAILABLE

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PATENTS

Copies of all patents reviewed can be secured from U. S. Patent Office, Dept. of Commerce, Washington, D. C. for 25¢ each.

A METALLIC PRODUCT made essentially from sintered powdered metals. The metals are selected from the group: iron, nickel, cobalt, copper, cadmium, lead, tin, and molybdenum or mixtures of these metals or alloys of them. The article is made to contain minimum amounts of the bromides of the metals intermixed with the metallic material.

Process of Forming Powdered Metal Parts in Atmosphere Containing HBr and Articles Resulting Therefrom. U. S. Patent No. 2,765,519 — Henry L. Crowley and Marion Ernest Graham—assigned to Republic Steel Corp.,— issued October 9, 1956.

A PROCESS FOR PREPARING precipitated silver powder in which an aqueous silver nitrate solution containing between 550 and 940 grams of silver per liter and 1.0 and 3.5 grams per liter of residual nitric acid is treated with an alkali metal salt. The salt is sodium or potassium carbonate, bicarbonate or hydroxide in an amount in excess of that which will precipitate substantially all of the silver from solution and react with substantially all of the excess nitric acid.

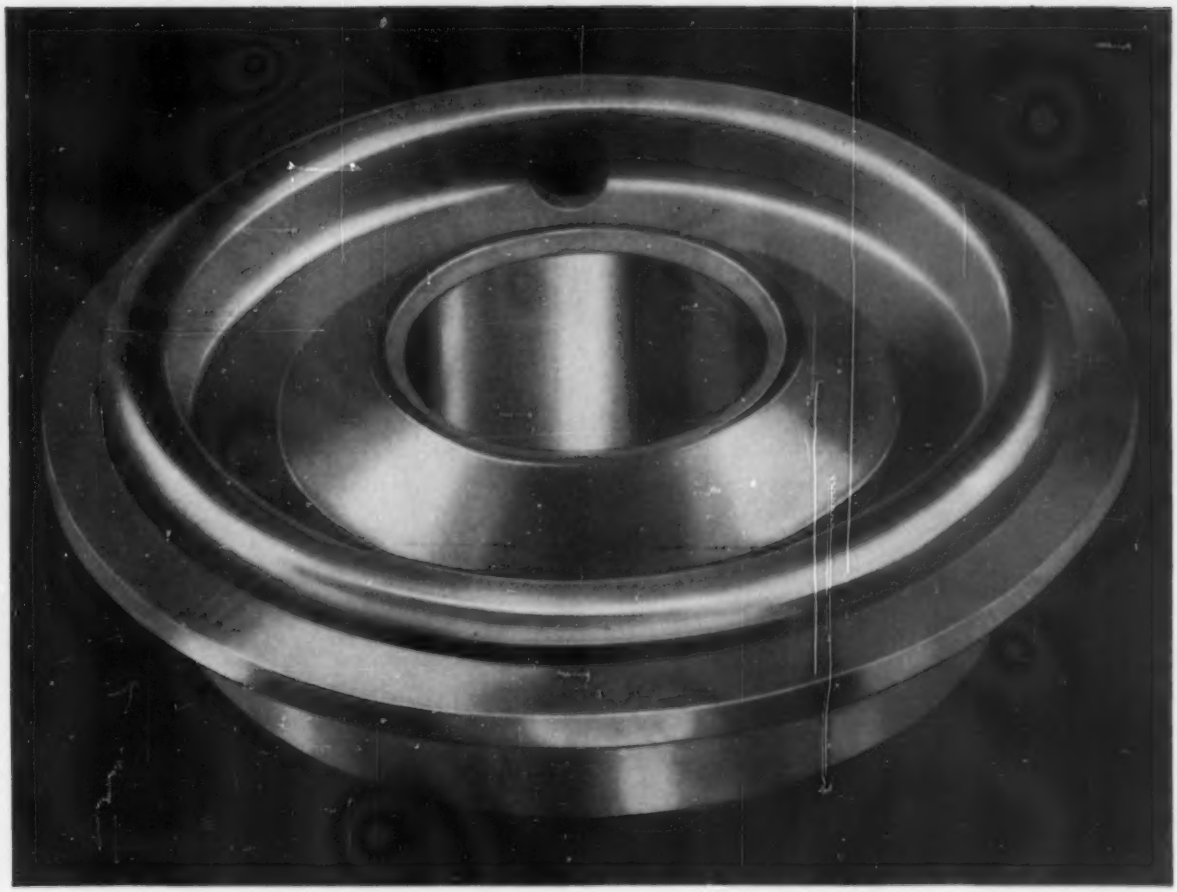
Patent No. 2,752,237—Oliver A. Short—assigned to E. I. du Pont de Nemours & Co.—Silver Powder and Method for Producing Same—issued June 26, 1956.

A POROUS CHAMBERED BEARING designed for heavy duty that is made from metal powders in which a chamber to contain reserve lubricant is molded between the walls of the bushing and is entirely surrounded by the walls. Adequate web members for strengthening and stifining are provided.

(Patent No. 2,728,619—Heavy Duty Porous Chambered Bearing—John Haller—assigned to Allied Products Corp.—issued Dec. 27, 1955).

AN ALUMINUM ALLOY have a minimum tensile strength of 15,000 psi at a temperature of 600F, in the as-cast condition. The composition range is 6 to 18% copper, 4 to 8% magnesium, .0 to 2% manganese and 0.1 to 2% nickel. The amount of copper not less than the amount of magnesium and the balance aluminum.

Aluminum Base Alloy—Walter E. Sicha and Harold Y. Hunsicker—assigned to Aluminum Co. of America—patent no. 2,749,239—issued June 5, 1956.



shock absorber inner cylinder head shown about 5 times actual size

a YALE powdered metal part...designed to take constant pounding and come back for more

A small part, about the size of a quarter. But without it, the family car would ride like a bumpy farm wagon.

It's an inner cylinder head for an automobile shock absorber. Used on one of America's most popular cars. Its perfect performance is a critical element in providing a smooth, level ride.

Here is why YALE* was chosen to produce this part:

The manufacturer needed positive assurance that, in use, this part would not show appreciable wear from the original close tolerances required for a smooth ride.

He had to be sure the millionth part would be as accurate as the first. That we could handle the large quantities he needed. That he'd get imaginative engineering and delivery on schedule.

He found that YALE powdered metal parts answered every requirement. And it's quite probable that the car you're driving gives you a better ride because of his decision.

Perhaps you have a problem a YALE powdered metal part can solve. Our engineers are as close as your telephone whenever you'd like to talk about it.

*REG. U.S. PAT. OFF.

powdered metal parts

YALE & TOWNE

THE YALE & TOWNE MANUFACTURING COMPANY, POWDERED METAL PRODUCTS DIVISION, 9335 BELMONT AVENUE, FRANKLIN PARK, ILLINOIS

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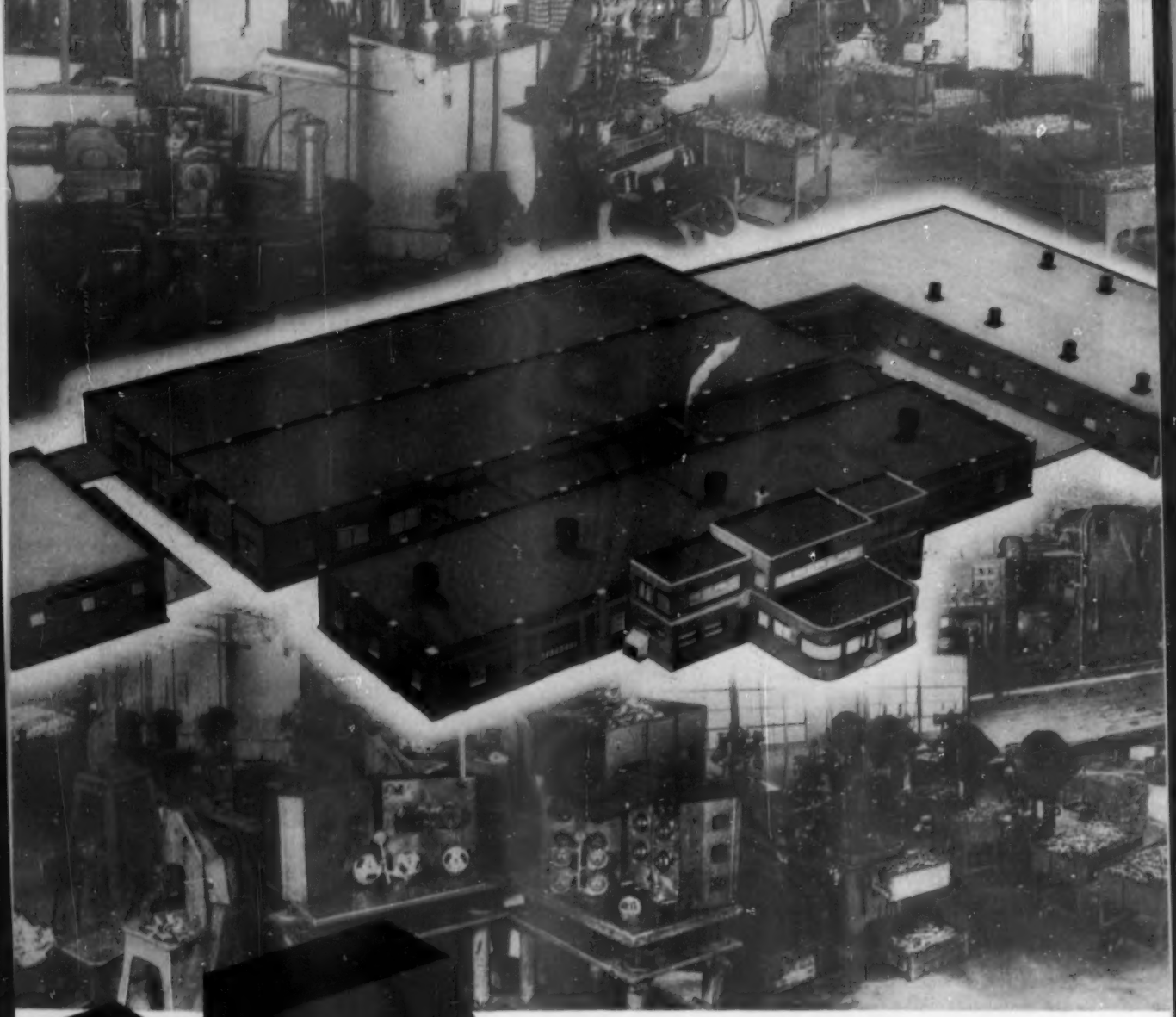

60,000 square feet of complete, modern die casting facilities

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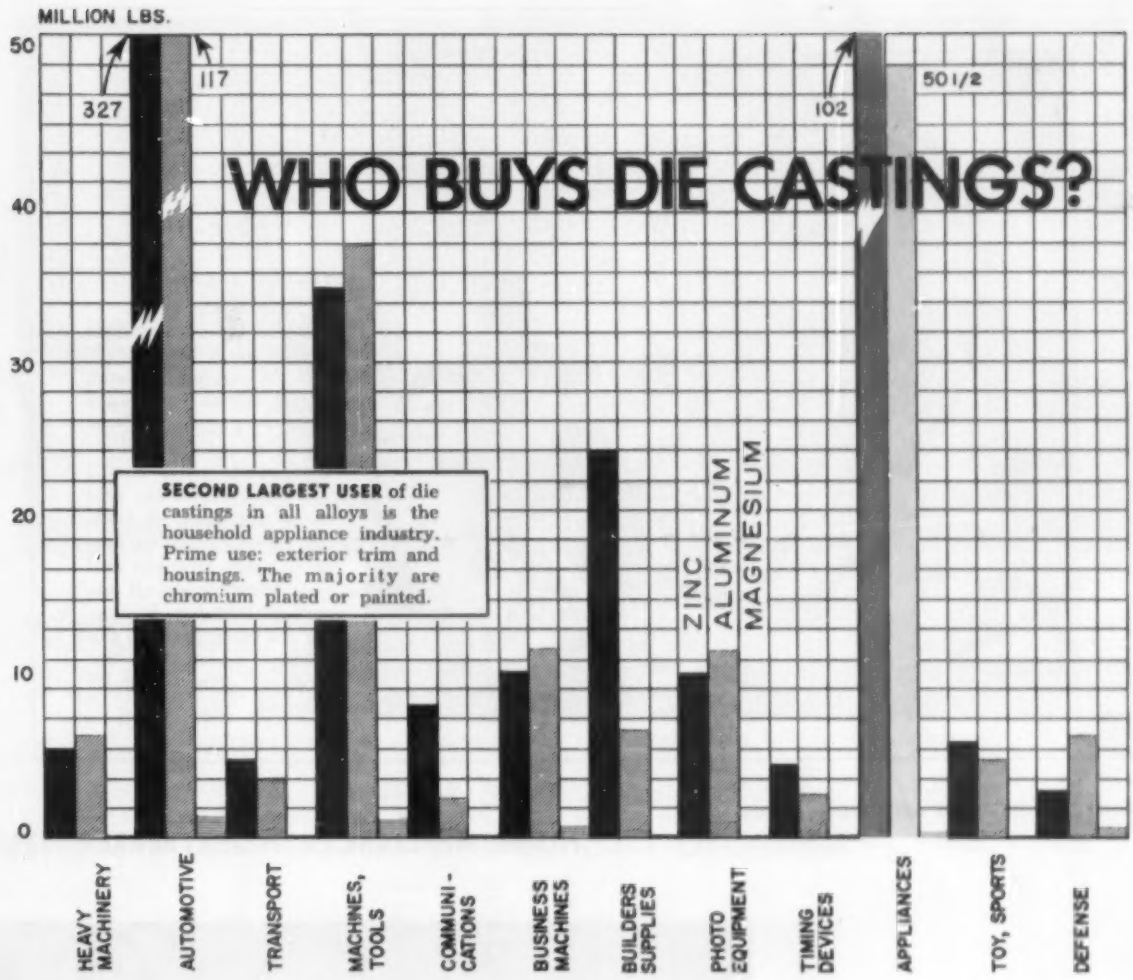
NEW ENGLAND DIE CASTING CO., WEST HAVEN, CONN.



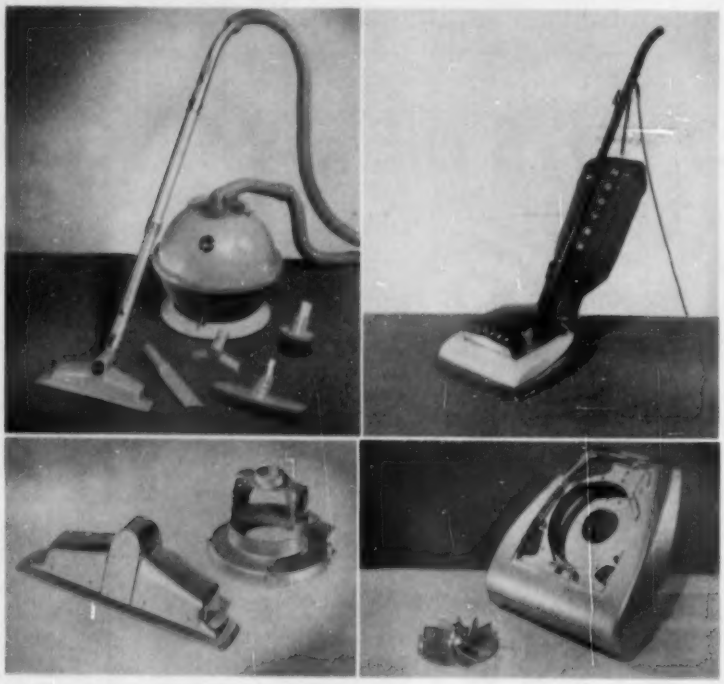
Manufacturers Of Household Appliances

"Many popular home appliances could not be made economically without the use of die castings. For example, we depend upon aluminum die castings in manufacturing garbage disposers. We could not offer these units to the general public at such low cost and, at the same time, obtain clean lines and good appearance, by any other process." E. E. WIECZOREK, Vice President of Manufacturing, In-Sink-Erator Mfg. Co.

WITHOUT DIE CASTINGS many household appliances would be priced so high that the large mass of people in the middle income groups could not afford them.

Structural parts, supporting members, decorative trim and operating components are die cast whenever possible. The intricate shapes that can be cast, the small amount of machining that must be done to ready the castings for assembly, the excellence of surface, the wide variety of surface finishes that can be used and the natural corrosion resistance of the alloys all contribute to holding costs down to a mass market level.

On the following pages are shown only a few of the typical die castings that are currently in use on a few of the many home appliances now available. Not shown are some of the units such as circulating and ventilating fans, food mixers and blenders, radio and TV sets, unit air conditioners and many others that are large users of both aluminum and zinc die castings. In all the appliance industry consumes about 102,000,000 pounds of zinc and 50,500,000 pounds of aluminum per year in the form of die castings.



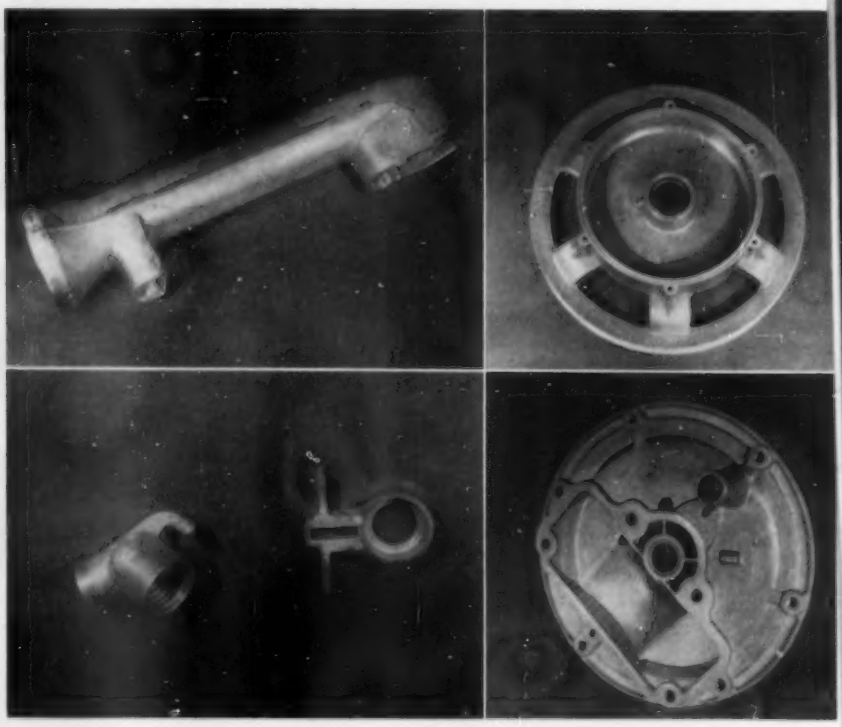
VACUUM CLEANERS: Hoover Co.

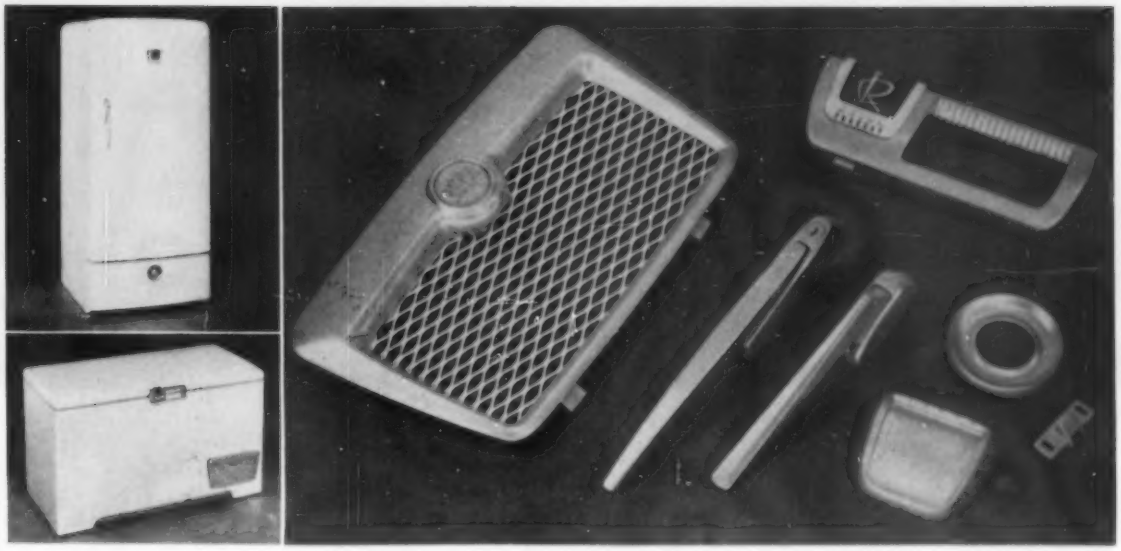
Main frame and nozzle in aluminum die castings, and fan and motor casing in zinc die casting, as are built into these Hoover cleaners, are typical of applications used in this type of equipment. Extreme intricacy of main frame, superior surface finish, high strength and close accuracy are all important features. By using die castings, both the product stylist and the product engineer can be satisfied.

"HOME APPLIANCES WORK BETTER, SELL

FREEZER-REFRIGERATORS: Amana

Serious design problem relating to latch handles on refrigerators has been solved by Amana engineers by using chromium plated zinc die casting. They have come up with a latch assembly that has minimum "pull-travel", lever arms that don't protrude from the door, and a clean, modern design.

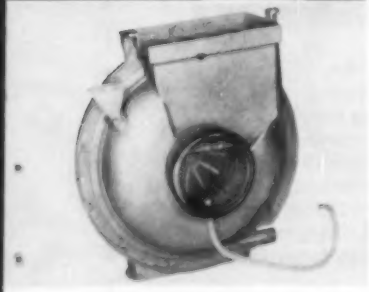




REFRIGERATOR-FREEZERS: Revco, Inc.

Not counting the die castings that go into the motor-compressor units of refrigerators and freezers, die castings are used mostly for handles and trim. In these applications, two factors are of prime importance: 1) the surface finish must always be of so-called "hardware" quality, and 2) both shape and contour must be most accurately maintained so that parts will fit without any forming or other operations after surface finishing. Generally, these parts are zinc die castings, chromium plated to give a durable part with pleasing appearance.

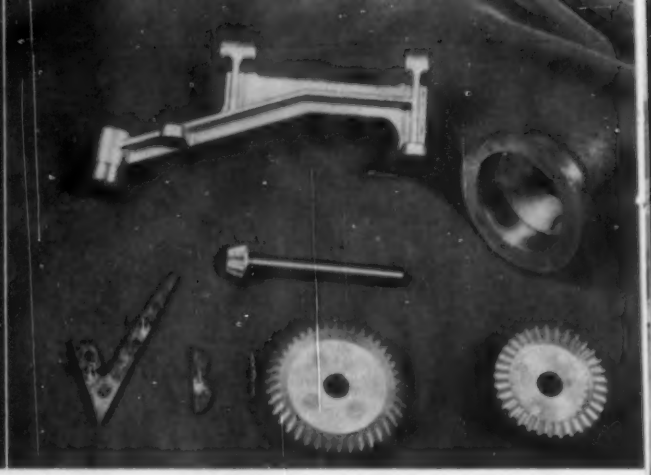
FASTER AND LOOK SMARTER WITH DIE CAST COMPONENTS . . . "

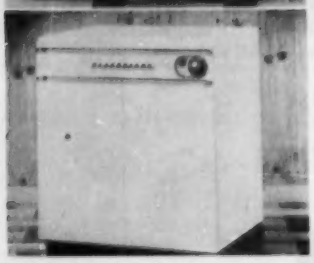


AUTOMATIC AND WRINGER WASHERS: Maytag Co.

Of the nine different die castings that are used in both wringer type and automatic washing machines, some were designed originally to be made as die castings, while others were redesigned from sand castings. Both zinc and aluminum are used, the criterion being light weight for aluminum, chromium plated finish for zinc. Several of the parts shown must be pressure-tight and are subjected to water testing. On one of these pressure-tight castings, the rate of rejects is kept below ½ percent by the vendor.

MORE APPLIANCES →





WASHERS AND IRONERS: Blackstone Corp.

Automatic washers and driers are two of the greatest consumers of die castings among home appliances. The present production is large and the market growing as wringer type machines are giving way to the automatics. Both of the Blackstone units shown here use die castings, some in unstressed and others in quite highly stressed applications. All parts were designed originally for zinc or aluminum die castings and do not replace any other method of manufacture. Choice of die casting alloy was made on the basis of functional requirement first, and to a lesser extent, relative cost of metals.

DISHWASHERS: Apex Electrical Mfg. Co.

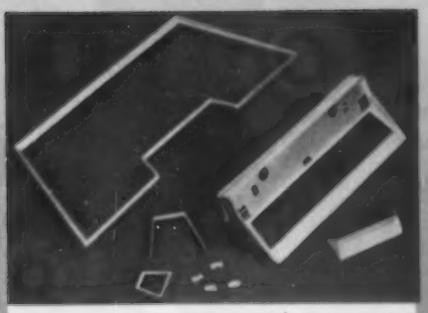
Both zinc and aluminum die castings go into automatic dish washers, mostly as housing members. Many of them carry components, align rotating members and assure dependable relative location of subassemblies. Included in this Apex unit are housings for motor, timer, actuator, as well as a vacuum breaker, light ring and lid accessories. Interchangeability of parts due to uniformity of die castings helps simplify production.

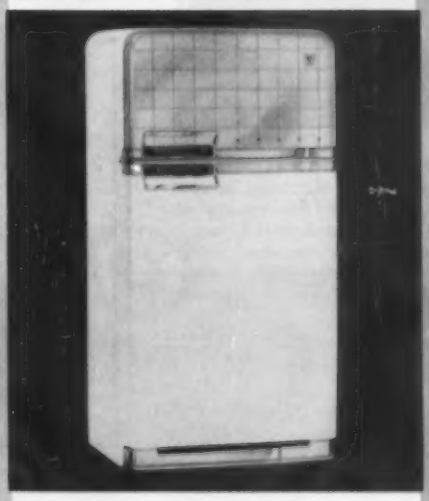
FOOD WASTE DISPOSERS:
In-Sink-Erator Mfg. Co.

While few appliances use highly stressed parts, food waste disposers are an exception. Vibration, off-balance, sudden shocks are normally carried by the die castings. The In-Sink-Erator unit shown uses one aluminum die casting between the motor-grinder and the sink flange, plus two other sizeable components. The use of die castings here contributes to appearance of the end product . . . a vital consideration in all consumer products . . . and also permits competitive pricing. The die cast aluminum alloy has physical properties adequate for all requirements of this type of unit.

BUILT-IN RANGES:
Geo. D. Roper Corp.

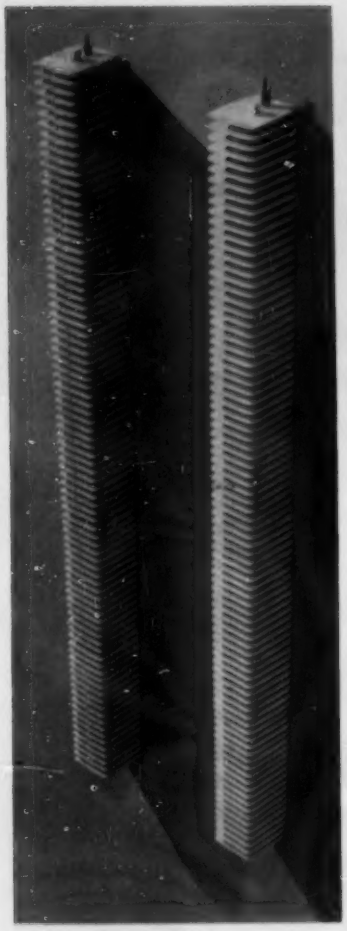
Relative new-comer in the appliance field is the built-in oven. Nature of this unit restricts the possible uses for die castings, except for trim and vent parts, such as the polished die cast aluminum vent on this Roper unit.

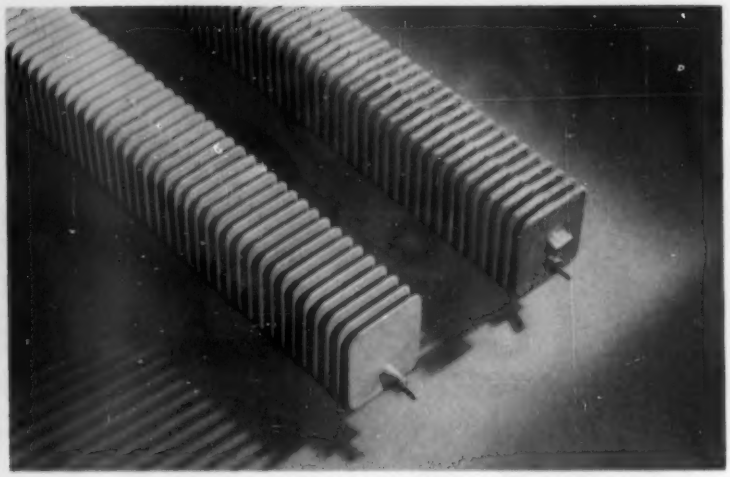




REFRIGERATOR-FREEZER:
Norge Div., Borg-Warner

Design latitude of die castings helps the designer of refrigerators and freezers to get the eye-catching designs needed to accentuate equipment which must, for functional reasons, be quite severe in appearance. Color and chromium plate applied to smooth die cast zinc provide attractive finishes.





INCREASE IN HEATING EFFICIENCY by 15 percent and reduction in cost by 25 percent are the results of changing these finned heating units from sand casting to shell mold casting. The two types of castings are shown above side by side in two views.

Pound-for-pound, shell mold castings are likely to cost less than comparable sand castings. The experience of this company may show you . . .

How To Cut The Cost Of Your Large Sand Castings

MANY non-ferrous casting jobs, especially in the larger size range are being moved from sand casting to shell mold casting. Costs are extremely favorable to the shell molded casting where any degree of complexity or accuracy is required.

This opinion is based upon the experience of an Eastern foundry, Lakeside Bronze, Inc., in Buffalo, N. Y., which is equipped to do both sand and shell mold casting. Several years ago this foundry built its own shell mold machine and began experimental work with the new process; now, a major part of the foundry's output is in shell molds.

Pound for pound, according to L. G. Smith, president of Lakeside, shell molded castings are likely to cost less . . . even before figuring the reduction in machining and other secondary operations. The foundry also likes the new process because it solves one of its most severe problems, the shortage of highly skilled molders.

What does a buyer of castings like about shell mold castings? To illustrate, take the example of a special, radiant base heater unit which Lakeside is producing for Electromode Corporation of Rochester, N. Y. These castings are made in two sizes, 28 inches and 44 inches long, with tubular sheathed heating elements cast as inserts.

While these castings are not critically dimensioned, they require a high degree of precision in other aspects. For instance, the

cast-in heating element must be quite accurately located in the center of the casting in order to get proper heat distribution. This is no easy job in a casting 44 inches long.

The castings must be free of entrapped air around the heating element, for these pockets would act as insulators, building up hot spots that could ruin the element.

For most efficient heating, the fins must be kept to minimum thickness. There is a trick of gating the shell molds to get proper filling in the 1/16" sections of the fins.

None of these functional "precision" requirements could be met in a sand molded casting. Now, having been converted to shell mold casting, Electromode is getting a measured increase of 15 percent in heating efficiency . . . and the castings are costing them about 25 percent less than their sand cast predecessors.

Why Steel Patterns?

Big cost, it can be seen, was for pattern equipment. Steel patterns were required here because of the large number of narrow fins. (If the pattern fins are bent, they can be bent back to position without costly repair work.) Savings on pieces soon amortized the cost of the patterns.

The shell size is two feet by four feet for the 44-inch unit, making two complete castings from each shell. At the time this job was started, no commercial machine was available to take this size shells, so the foundry built its own.

Most of the non-ferrous alloys are castable in shell molds, with the exception of lead base alloys. Magnesium also presents special casting problems. On the other hand, such metals as nickel bronze and Monel are well suited to shell mold casting.

The special advantages of shell mold casting, aside from the simple factor of lower piece costs, are outlined by Robert Graber, vice president of Lakeside Bronze, to include the following features:

1. High quality appearance,
2. Lowered weight per casting,
3. Simpler and faster foundry production,
4. Higher rate of mold production per man hour,
5. Higher yield of castings per ton of melt,
6. Lower finishing costs,
7. Greater percentage of marketable castings.

Each of these features, whether or not recognized as such by the buyer of castings, contributes to the lower ultimate cost of castings. Aside from these, the superior quality of the shell mold castings due to the self-venting characteristics of the mold, has been another contributing factor in the trend toward greater use of this type of casting.

In making any comparison between dry sand casting and shell mold casting, the company officials indicate, size of the casting is one of the main considerations: the larger the casting, the easier it is to compete costwise with green sand. The principal limit on size of shell mold castings now is determined by the capacity of the mold making machines.

Three Ways to Cut Costs

Three things the shell mold caster can watch to keep his costs down are indicated by Mr. Graber:

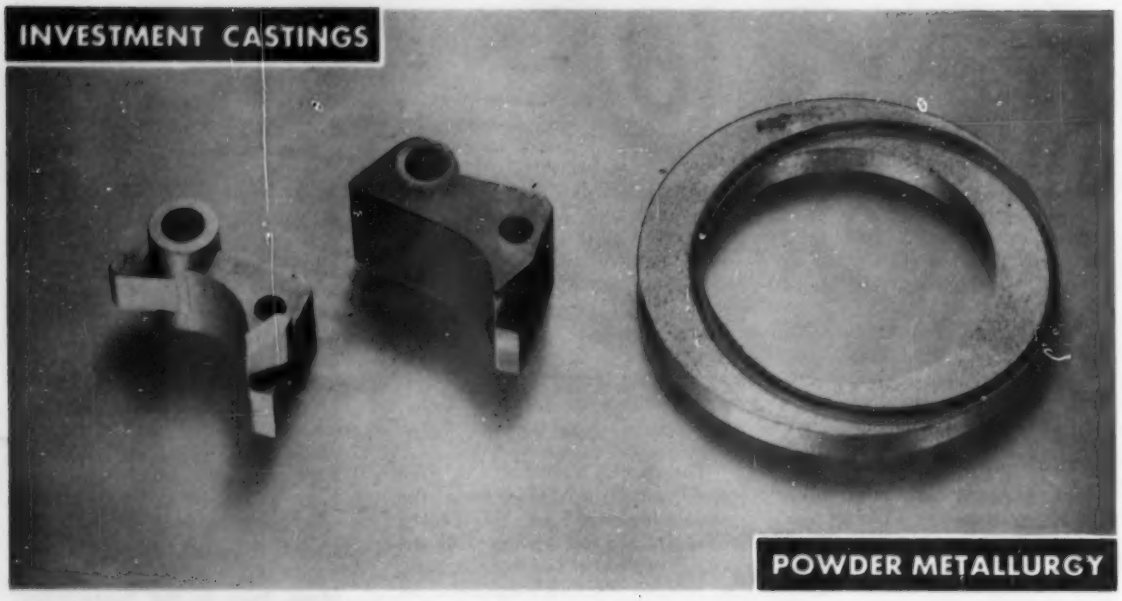
1. Use the coarsest sand possible that will still produce the desired casting finish.
2. Develop the thinnest mold that will still have the required strength.
3. Cut down on the size of non-productive edge areas of molds.

HOW LAKESIDE MAKES SHELLS FOR A PAIR OF 44-INCH CASTINGS . . .

STEEL PATTERNS are used in making these shells which measure 2' x 4'. Each shell makes two complete castings. Resin used by the foundry is Durez 18250. The company now has two shell molding machines and three core machines.

Photos from Durez Plastics Div., Hooker Electrochemical Co.

EXAMINING THE SHELLS for possible defects is an important part of the cycle. Note the large number of narrow fins which dictate the use of steel patterns. Sheathed tubular heating elements are cast as inserts and must be accurately positioned.



Shortages of special bar stock forced this company to try investment castings in their machine tools. Now . . .

A "Substitute" Material Has Become Standard

WHEN wartime shortages cut off its source of supply for rolled bar stock with irregular cross section, one large manufacturer of machine tools looked into possible alternative methods of making the small ratchet pawls that had previously been cut from rolled bar.

The company's practice had been to buy enough bar stock at a time to last for two or three years, cutting off the pawls as needed and machining additional configurations not provided by the rolled contour.

They hit upon investment casting as a possibility, and had a set of pattern dies made. Since these are precision castings, most of the configurations which were formerly machined into the rolled stock could now be incorporated in the casting. The alloy called for in their prints was 3120 steel, a composition which the investment caster was able to furnish.

The investment cast pawls are still being procured, as needed, from the foundry. As received, they need only the reaming of two holes, finish grinding two surfaces and case hardening. The cored holes are finish machined to .250 + .0005—.0000 which cannot be met by casting.

The company's experience with this first series of small ratchet pawls, one of which is illustrated above, was the result of an emergency situation, but has been successful enough that additional components have since been converted to investment casting. A variety of pawls, links, eccentrics, tool holders and work holders are now being produced by this method.

Finished piece cost, on many of these castings, is somewhat higher than the comparable part machined from bar, but the advantages of prompt delivery, lightening of the inventory load and simplification of in-plant operations are real, though less tangible factors which enter the calculations.

Company methods engineers now report that they design components of this type as investment castings from the start, even though a shortage of rolled stock was the original reason. At that time, four basic bar shapes were stocked, from which some 14 different sizes and variations of pawls were cut. The practice now is to have a different pattern die for each size and thus obtain exactly the piece required.

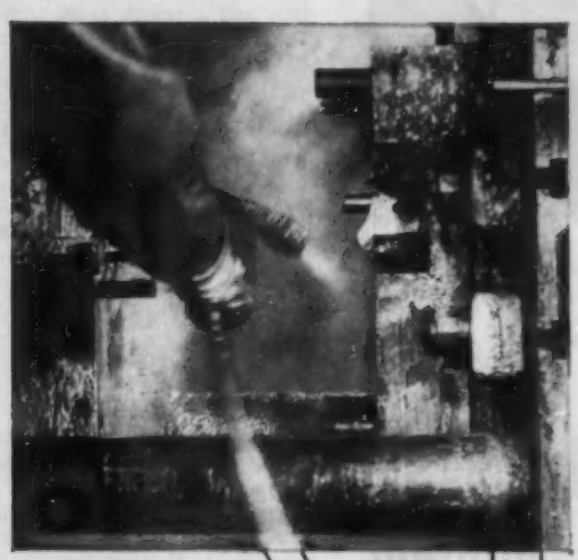
Some minor design changes were introduced to adapt the part from one fabricating method to another. Most important was the lightening of sections, coring out unneeded stock and introducing shape refinements.

Spacing collars by powder metallurgy

This company also makes use of powdered metal parts for spacing collars, which are used in large numbers in their machines. These spacers, simple in shape, are pressed from bronze powder. Even

Continued on page 71

'dag' dispersions... *a touch does so much!*



Bendix uses 'Aquadag' to boost die-casting production

The die-casting of magnesium and aluminum presents unusual problems that make the selection of a die lubricant vitally important. Bendix Foundries, Bendix Aviation Corporation, Teterboro, N. J., has found **'Aquadag'**, a dispersion of colloidal graphite in water, most effective in the quantity production of magnesium jet-engine components and aluminum instrument die-castings.

Standardizing on a simple, economical 1:40 dilution of **'Aquadag'** in water, Bendix finds that the thin, tenacious *dry lubricating film* formed on the dies by this blend produces consistently uniform die-castings. In addition, easier parting, reduced tendency for the molten metal to alloy with the steel dies, and less frequent application, have all helped to increase production substantially.

Full information, telling how **'dag'** dispersions can improve *your* die-casting production, is contained in the Acheson Bulletin 425 on Metal Casting Operations. Write for your copy today. If you have a specific problem there's an Acheson service engineer in your area who will be glad to work with you.

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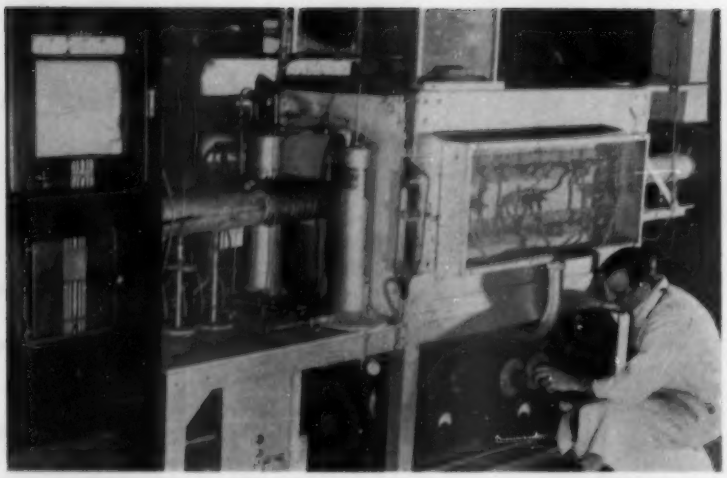


1. **A CONTINUOUS** type tubular muffle furnace with a water cooled discharge end. In this furnace an Inconel muffle is used, heated with AT type Globar elements operating in air. The tubular muffle is gas tight for controlled atmosphere operation.

Metallic Muffle For High-Temperature Sintering

By EDMUND N. MAZZA, Engineer-in-Charge
Sylvania Electric Products, Inc., Atomic Energy Division

THE use of the powder metallurgy technique in the production of stainless steel parts involves many problems. One of the prime considerations in this type of fabrication is the type of furnace muffle to be used. The muffle should withstand temperatures in the 1300 −1350 C (2372 −2462 F) range and in addition must be able to withstand the thermal shock which results from stoking the sintering boat through the furnace.

Refractories such as alumina, mullite, sillimanite, etc. fulfill the temperature requirements, but the thermal shock properties are frequently not adequate. In a closed system, cracks in a muffle cannot be tolerated since air leakage will contaminate the atmosphere. In the case of hydrogen, or other reducing atmospheres, this will result in a lowering of the dew point which is intolerable where an extremely dry atmosphere is required.

Since a very dry atmosphere is a requirement for sintering stainless steel parts, it becomes evident that any muffle for this type of service should have good thermal shock characteristics. Most ceramics do not meet this requirement and the few ceramics that might prove satisfactory are unavailable in the sizes required.

Because ceramic materials were not the answer to the furnace muffle problem, metallic muffles made from high melting point alloys were investigated. Up to the present time, muffles fabricated of Inconel have proven successful. Although this material is being used at a temperature close to its melting point (1395 C), very little creep or sag was noticeable after months of operation.

A round muffle was used in a Globar heated furnace of the type shown in Figure 1. The Inconel had an outside diameter of 4 inches, an inside diameter of 3.548 inches, a wall thickness of 0.226 inch and a length of 90 inches. The muffle was supported along its length at approximately one-foot intervals by contoured refractory brick capable of withstanding temperatures to 3000 F.

Gas-tight seals were made for each end of the muffle to insure leak-proof connections between muffle and cooling chambers. This type of seal facilitates the removal of the Inconel muffle when repairs are required. A sketch of the seal arrangement is shown in Figure 2. This seal consists essentially of three parts; a threaded sleeve which is welded to the cooler, asbestos packing, and a collar which is screwed over the sleeve forcing the asbestos against the muffle.

Although the muffle described above is round, other shapes have been used. Rectangular, square or D-shaped muffles require the proper constructional strength to prevent sagging at high temperatures. The dimensional limits of Inconel muffles with given modes of support have not been investigated. There is in all probability, however, a width and height limitation which, when exceeded, would result in excessive sagging.

In order to insure an oxide-free surface on the inside of the muffle, a reducing atmosphere must be supplied when the tube reaches the red heat range, approximately 1000 F. On shutdowns, the atmosphere is maintained until the black heat range of below 1000 F is reached. This procedure results in a very dry atmosphere which is not contaminated by any reduction of an oxide coating from the inside of the muffle.

An Inconel tube which was used for approximately 1000 hours at temperatures between 1300 −1350 C and for 2000 hours at temperatures of 1100 −1250 C was evaluated to determine the extent of deterioration. A metallographic investigation was undertaken to learn the depth of

penetration of the oxide on the outside and inside walls of the muffle after approximately six months of service.

The photomicrograph, Figure 3, shows that very little oxide penetration had taken place on the outside surface and also, that there is little or no oxide on the inside wall. These cross-sections were taken from a part of the muffle in the hot zone of the furnace. From an examination of the condition of the muffle, one may conclude that an Inconel tube should give satisfactory service for at least 10,000 hours.

Savings Per Year: $3000

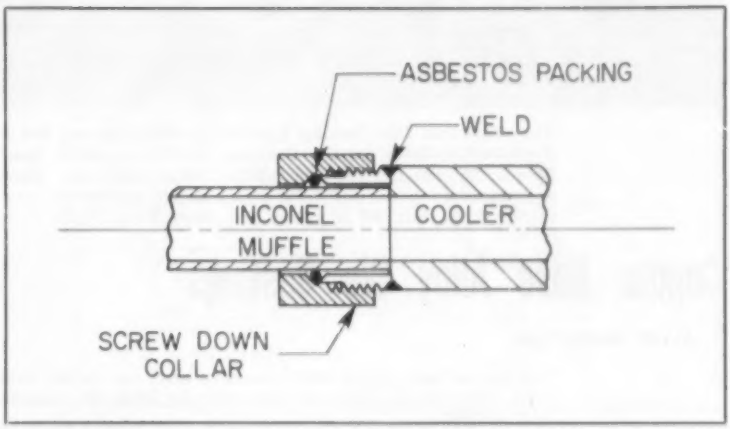
The economies effected by the use of an Inconel rather than a ceramic muffle were considerable. Tube replacement is less frequent and down time required for muffle installation was greatly reduced. The over-all savings amounted to approximately $3,000.00 a year.

The use of an Inconel muffle necessitated an investigation into the type of material most suitable for sintering boats. Ceramic boats, with their poor thermal shock characteristics, were promptly eliminated. An investigation into metal boats revealed that at temperatures below 1200 C stainless steel, Inconel or other high melting point metals may be used for sintering without too much danger of alloying with the muffle. At temperatures above this point, however, the stainless steel, Inconel or molybdenum will alloy with the Inconel muffle.

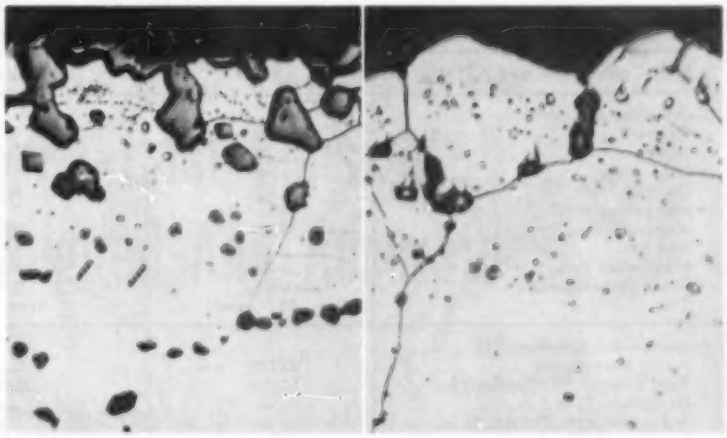
This alloying problem was solved by welding Kanthal strips around the stainless steel boat. These strips were previously oxidized at 1800 F for 1 hour. A typical boat is shown in Figure 4.

The use of Inconel for a furnace is limited to applications where the maximum temperature does not exceed 1350 C. Ceramic muffles must be employed in applications where the temperature exceeds this point. Investigations are presently in progress to evaluate the use of cermets which may prove to be more favorable for high-temperature applications.

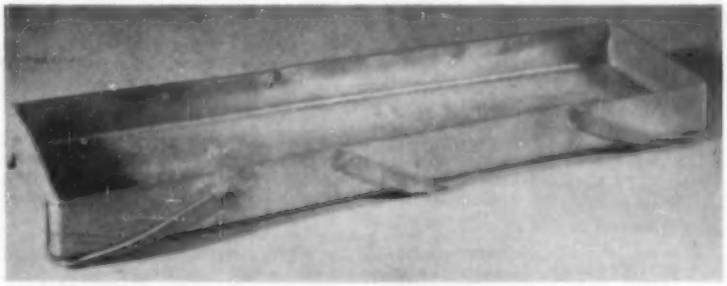
The author wishes to take this opportunity to thank F. A. Roldan for the experimental work in this investigation.



2. ONE TYPE of connection that can be used between an Inconel muffle and the cooling chamber. This design gives a gas tight joint to prevent infiltration of air into the muffle or leakage of the controlled atmosphere out of the muffle.



3. THESE PHOTOMICROGRAPHS show both the outside (left) and the inside (right) of an Inconel muffle after operation at high temperatures. The low oxide content of the metal near the outside surface and the almost total absence of oxide on the inside are notable. Micrographs at 500X.



4. WELDING OF THE INCONEL boats to the furnace tube has been prevented by welding preoxidized Kanthal runner strips onto the outside of the boats. The high aluminum content of the Kanthal provided an aluminum oxide contact surface.

The American Die Casting Institute recently issued the first several of its Metallurgical Series of Product Standards for Die Castings, providing useful data as a guide to engineers and designers. Standards covering the composition, properties, and characteristics of copper base die casting alloys are presented here. Complete copies of all Standards are available by writing to American Die Casting Institute, Inc., 366 Madison Ave., New York 17, N. Y.

Copper Base Alloy Die Castings

1. ALLOY SELECTION

The copper base alloys most generally used are shown below. Die casting and machining characteristics involved in alloy selection and the basis for specifying brass die castings are covered in a later section.

2. COMPOSITION AND PROPERTIES

The chemical compositions of copper base alloy die castings and related typical values for physical properties and constants are shown in the table. The typical values indicated are for separately die-cast test bars and do not represent values for specimens cut from die castings.

Designation	Standard Copper-Base Alloys		
Commercial and ASTM	Z30A	ZS331A	ZS144A
Composition-per cent (1)			
Copper	57.0 min.	63.0 to 67.0	80.0 to 83.0
Silicon	.25 max.	0.75 to 1.25	3.75 to 4.25
Lead, max.	1.50	0.25	0.15
Tin, max.	1.50	0.25	0.25
Manganese, max.	0.25	0.15	0.15
Aluminum, max.	0.25	0.15	0.15
Iron, max.	0.25	0.15	0.15
Magnesium, max.	—	—	0.01
Other elements, max.	0.50	0.50	0.25
Zinc	30.0 min.	Remainder	Remainder
Properties and Constants (2)			
Tensile Strength, psi	55,000	70,000	85,000
Yield Strength (0.2% offset) psi	30,000	35,000	50,000
Elongation, % in 2 in.	15	25	25
Impact Strength, Charpy, ft. lb.	40	50	70
Hardness, Rockwell B Scale	55-60	68-72	85-90
Modulus of Elasticity (3)	15	15	20

(1) Composition in per cent as indicated. Same as ASTM B176.
(2) Data from ADCI — average typical properties for separately die cast test bars.
(3) To be multiplied by 10-6.

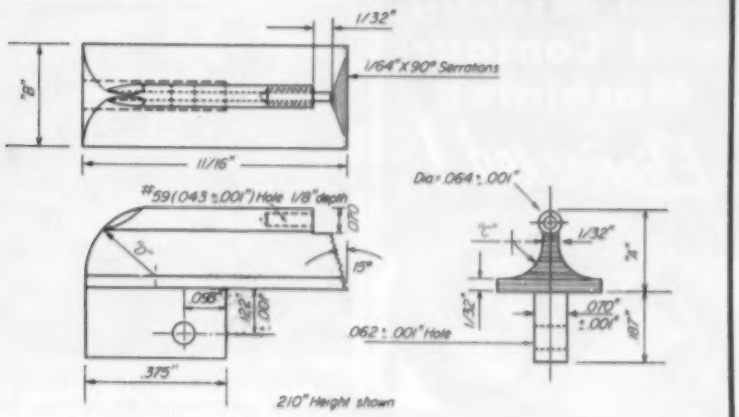
3. CHARACTERISTICS OF COPPER ALLOYS

Copper alloy die castings have the highest mechanical properties and corrosion resistance of all die castings. While the standard copper-base alloys generally used are readily die cast in intricate shapes, the high temperatures and pressures at which they are die cast results in comparatively short die life. Thus, copper alloy die castings are relatively high in cost as compared to die castings of other metals.

However, where added strength, corrosion resistance, wear resistance, and higher hardness are required the possible economies of these die castings should be carefully considered.

While all of the standard copper-base die casting alloys offer the excellent properties outlined, careful evaluation of their characteristics in the light of the specific application is required and may justify the higher cost involved. For example:

- Alloy Z30A is a general purpose, low cost, 60-40 type, yellow brass alloy, containing tin and lead, with good machineability and soldering characteristics. It has the lowest mechanical strength of the three standard alloys.
- Alloy ZS331A is a general purpose alloy having higher strength than Z30A. It is somewhat easier to die cast but slightly more difficult to machine.
- Alloy ZS144A has the highest mechanical strength, hardness, and wear resistance of the three alloys but is most difficult to machine. It is generally used only when the application requires the high strength or resistance to wear.



1. VERY LITTLE FINISHING is needed on the cast gunsight, top left, shown as received. One hole is punched and another drilled to give the finished unit shown below.

2. DIMENSIONS ARE HELD close enough in casting, above, so that no milling or other surface operations are required. Black oxide coating is applied for protection.

Low-Cost Gunsight... Rugged And Accurate

By K. NICHOLAS, Chief Engineer
Redfield Gunsight Company

THE physical, mechanical and metallurgical characteristics that are required of a hunting rifle sight place it in a class that is unique in the manufacturing field. It must be highly accurate, it must be highly corrosion resistant, it must stand considerable abuse, and it must be relatively inexpensive to manufacture.

All of these requirements, except cost, could be met by machining the sight out of hardenable steel, but the cost would be so high that the sight could not be marketed. To secure all of the desired qualities at a moderate cost, the Redfield Gunsight Co. has at least one style of front sight investment cast by Illinois Precise Casting Co.

The sight shown in Figures 1 and 2 is cast in 1020 steel to the dimensions shown on the print. This casting operation is so accurate that only minor machining needs to be done after it is received from the foundry. The 0.062" diameter hole in the blade is punched and the No. 59 hole to accept the gold bead is drilled. Generally, these two operations are all that is required to finish the part.

Surface finish on a part such as this one is most important. The sights are sand-blasted and given a "Du-Lite" treatment to form a black oxide surface coating. After the blackening treatment, the gold bead is pressed in.

How, then, does such an investment cast sight meet the requirements:

ACCURACY: Because the sight is investment cast, it is possible to hold dimensional tolerances extremely closely. Examination of the drawing shows that for critical dimensions the vendor of the casting is able to hold to as close as ± 0.001. In certain of the relationships, parallelism and per-

Continued on page 70

Cam Milling and Contour Machining *Eliminated!*

This EPCO

INVESTMENT CASTING Proves the Point

PART: Cam for Aircraft Instrument

MATERIAL: Stainless Steel, 440

PROBLEM: To reduce time and cost involved in setting up and performing 8 different types of machining operations.

SOLUTION: An EPCO Investment Casting Completely dispensed with

1. Cut-off
2. Turning O.D.
3. Center Hole Drilling
4. Form Turning
5. Form Milling
6. Contour Milling
7. Slot Milling
8. Cam Milling

Leaving only cam polishing, bottom grinding and hole reaming.

CONCLUSION: Intricate Machine Parts by redesigning to EPCO Investment Casting tolerances can be made to give *better* performance at far less cost.

Send us drawings, samples and specification of parts for detailed process analysis and cost quotation without cost or obligation.

ENGINEERED PRECISION CASTING CO.
FREEHOLD RD.
MATAWAN, N. J.

MEMBER INVESTMENT CASTING INSTITUTE

Circle No. 30 on Reader Service Card

BECAUSE OF THE GREAT INTEREST in vacuum die casting shown by both users and producers of die castings, PMM presents here a report on a recently introduced . . .

Vacuum Die Casting System

A NEW vacuum die casting system, available in both hot and cold chamber machines, has been introduced by the Kux Machine Co. It provides venting of the dies by vacuum before metal injection. Superior qualities claimed for the castings produced by this system include: greater density, less porosity, greatly improved surface finish, improved plateability, less flash, cleaner threads and closer dimensional tolerances.

The Vac-U-Die method consists of building the necessary hydraulic and electric valves and switches into the machine for proper sequence operation. Vacuum pump and storage tank of comparatively small size are needed. The unit is flexibly piped to the ejector box section of the die on the machine.

There is no reduction in overall casting cycle speed, which means that castings can be made at the same rate as on standard non-vacuum models. Dies get into production faster, it is claimed, because no initial changes in venting, gating or overflow pockets are needed. Only negligible changes are needed in die construction: housing and sealing the ejector box and gasketing meeting sections of the die. One or more of the ejector pins are used as a vacuum line valve leading from the cavity or runner back. The ejector plate is harnessed to a hydraulically operated ejection cylinder built into the movable die platen, and this cylinder operates both the vacuum line movement and final ejection of the casting in proper sequence.

Cycle of the machine is completely automatic in that movement of a single pushbutton actuates the machine through a full die casting sequence, with all phases automatically timed and controlled.

In a plunger gooseneck style of machine, initially, the die halves close and lock with the ejector plate in its back position, allowing passage of air from the die cavity to the ejector box. The metal injection plunger then travels down, only sufficiently to close metal inlet holes in the gooseneck, then stops.

At this point, a main vacuum line valve opens allowing evacuation of air from the die cavity, runners, sprue and ejector box by the vacuum pump. When the preset vacuum pressure is reached, which can be as high as 28″ of mercury in the die, and which normally takes only a fraction of a second to occur, the ejector plate is hydraulically moved forward to close vacuum lines leading from the cavity to the ejection box, thus preventing molten metal from entering.

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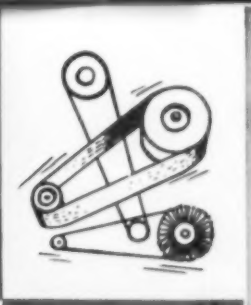
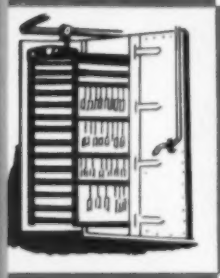

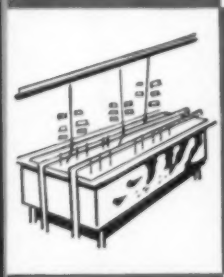

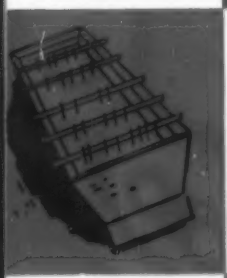

PMM

Finishing Section

Finishing includes all secondary operations performed on precision metal molded parts — up to and including final surface treatment. This section presents new information about the specialized methods, equipment and materials needed for finish-machining, assembly, surface preparation and final finishing of all precision metal molded parts.

devoted to the specialized problems of finishing . . .

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INDUSTRY'S WORKSHOP FOR THE FINEST IN PLATING AND POLISHING PROCESSES • EQUIPMENT • SUPPLIES

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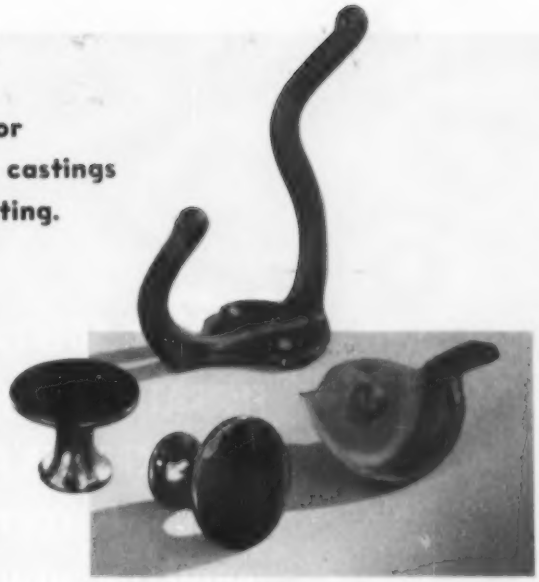
This new, low-cost method of applying color directly to zinc and aluminum die castings is based upon a special chromate coating.

How To Apply Direct Color To Die Castings



COLORED HARDWARE should have great sales appeal. The four pieces shown here are zinc die castings produced in black, brass and copper shades.

By K. P. BELLINGER and E. G. CHAPDELAINE

COPPER AND ZINC PLATED novelty charms have been colored and lacquered for maximum surface protection.

A simple new process makes possible the direct application of colors to aluminum and zinc die castings and zinc and cadmium plated metals in a manner that, until recently, has been impossible.

Developed by the Conversion Chemical Corporation of Rockville, Connecticut, the process is called Kenvert-O-Color, and appears to have wide-spread application.

The range of colors extends from black through a wide variety of bright, solid colors, including a complete group of brass, copper, and antique-bronze tones, and the currently popular gold tones.

How To Color Plated Surfaces

In treating plated metal surfaces, the work is transferred directly after plating and rinsing to an appropriate proprietary Kenvert bath, which deposits a chromate film. The film is of sufficient depth and uniformity to assimilate the desired color, and varies with application from yellow to a dark olive-green. Because of this color variation, certain light pastel shades, i.e., light pastel pinks, greys, blues, and white gold, are excluded from the color range of finishes.

After rinsing, the parts are transferred to the low-concentration (0.1 to 1.0 percent by weight of the solution) color bath, which operates satisfactorily at room temperature. Carefully selected organic dyes are used. No other fixitives are required in the bath, but agitation is necessary.

Complete coloring takes place in one to three minutes, but usually one minute is sufficient. The work is then cold and warm rinsed for drying.

How To Color Zinc Die Castings

For zinc die castings, better adhesion and color uniformity are attained by treating with a special alkaline treatment prior to applying the chromate coating. The alkaline treatment is applied at or near the boiling point from one to three minutes. It is then followed by a rinse.

The chromate film formed on zinc die castings is darker than the zinc-plate film. However, the brighter colors can still be applied if the die castings are preplated with zinc prior to treatment.

All chromate coatings are applicable at temperatures from 65 F. to 90 F. and hence, no special ventilation is required. The process may be carried out in tanks of steel lined with polyethylene or polyvinyl chloride.

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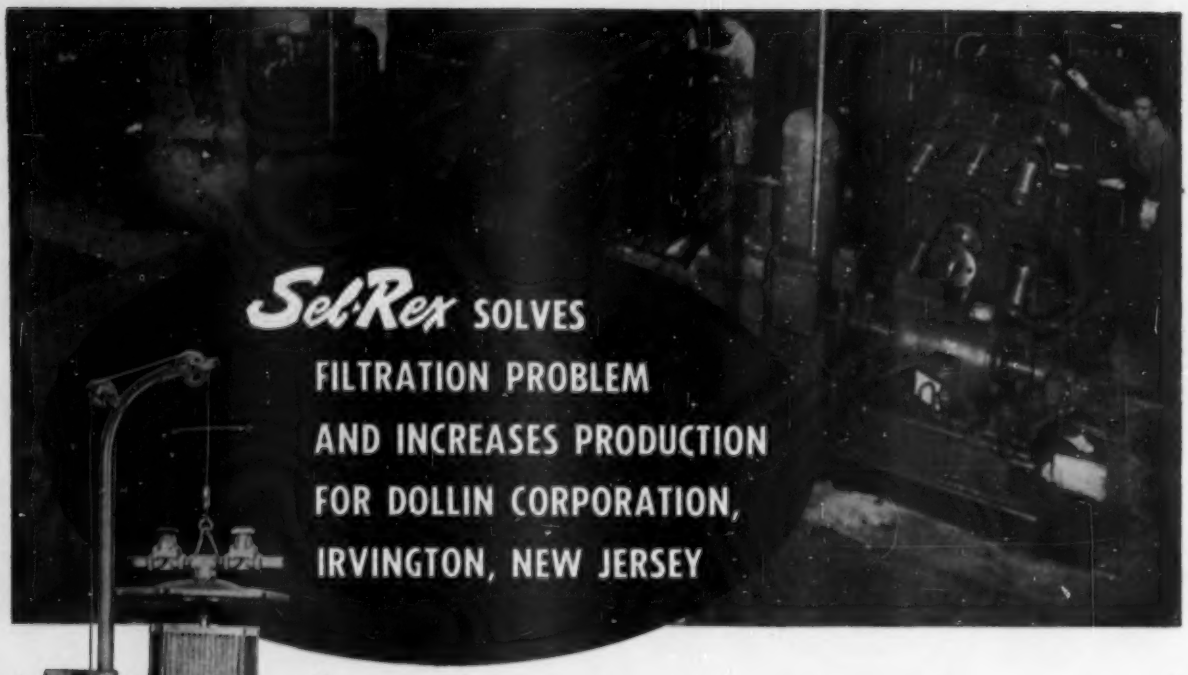
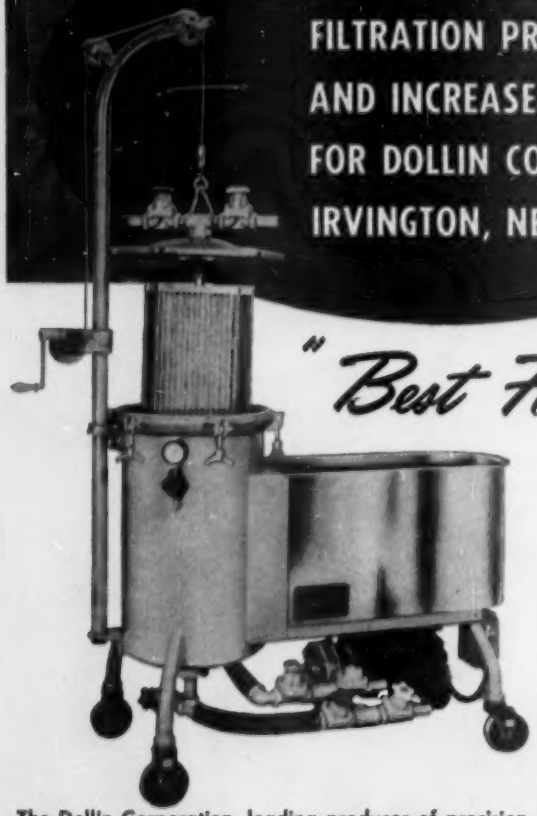


Sel-Rex SOLVES FILTRATION PROBLEM AND INCREASES PRODUCTION FOR DOLLIN CORPORATION, IRVINGTON, NEW JERSEY



"Best Filter on the Market..."

says Eric Reinhold
Chief Plant Engineer.

"Our Sel-Rex Filter removes foreign matter from the hydraulic fluid in our new die-casting machines— ***without interrupting production.*** *Not only do we get maximum efficiency from our costly equipment, but the reclamation of used hydraulic fluid to "like new" condition has already paid for our Sel-Rex. For my money, it's the best filter on the market."*

The Dollin Corporation, leading producer of precision die-castings, had frequent interruptions in production for filtering and replacing hydraulic fluid (viscosity—200) in their high speed die-casting machines. Their Sel-Rex Filter has eliminated this profit-eating downtime by doing the job *while their machines are in operation.* In addition, their Sel-Rex transfers hydraulic fluid from the barrel to the machines and back—as required. Like getting two machines for the price of one.

Whatever your liquid clarification or solids recovery problem, Sel-Rex—the fastest cleaning filter on the market—will increase your production, because you'll spend more time filtering, less time cleaning. Super-efficient filtration is assured by permanent, stainless steel mesh filter elements, attached to the easily removed tank cover for quick cleaning. No costly filter cartridges to replace.—*Dollin saves $15 per machine filtered on this feature alone.*

See for yourself why Sel-Rex assures better, faster, cost-cutting filtration. Send for your FREE copy of GUIDE TO BETTER FILTRATION, right now.

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Tanks of polyester and glass fibers, and ordinary crocks have been used successfully.

Because most of the chromate coatings involved offer corrosion protection well in excess of 100 hours of salt spray, it is obvious that colored films involving these coatings are desirable for other than eye appeal.

These chromate films are advised for their corrosion protection and attractiveness; rather than for the additional hardness that they impart to the relatively soft base metals—zinc, cadmium, and zinc die castings. For this reason, the final color is usually given a coat of clear lacquer or enamel for wear resistance and hardness.

Since the chromate films are well recognized for their ability to give excellent adhesion to organic films, the extra protection offers real and continued protection in direct proportion to the choice of organic film.

Black On Zinc

In the case of black on zinc, a wax emulsion may be used to fix the surface. At one installation, the emulsion has eliminated the need for an operator to oil the parts after drying, as had been the practice while using another process. Blacks of this type offer considerably more corrosion protection at a lower processing cost than oxidized or chemical blacks; and it is easily understood why they are of significant interest to industry.

THESE TYPEWRITER parts are typical of the many different sizes and shapes of part that can be successfully colored. In this case, the steel stampings are zinc plated, given a chromate conversion coating and then dyed black. To secure the gloss and finish that is desired on these parts a final waxing operation is employed.

Present methods require colored films to be applied to racked work only; whereas the blacks may be processed in small baskets, since the chromate finish on which the black is absorbed is quite durable as formed. Actual applications—outside of color identification work—are as limitless as the designer's requirements, and depend upon the stability of the chromate film and organic coating to the application.

Pastel Colors On Aluminum

In the case of aluminum, only pastel colors are available, since the chromate films on which the colors are absorbed are thinner, and hence can absorb less color. As the chromate film has less color, it gives less color interference to the dyed finish.

The same features of very excellent corrosion protection and adhesion to organic coatings are also characteristics of the film. The time for applying the colored films is slightly longer for aluminum than for other metals.

Cost of chromate coatings on aluminum probably is about 1/10 as much as anodized coatings. Cost of processing through the color bath is equal.

Initial interest is centered in the gold or oxidized tones for appliances, hardware, and automotive trim; with color coding being the most interesting to firms requiring it for identification purposes.

In every case, pleasing effects can be created and corrosion protection offered to a degree which will make new tools available to the designer and color stylist.

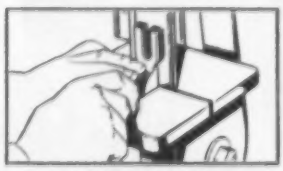
Hammond of KALAMAZOO

FOR DEBURRING ECONOMY

Model 50-DD

CONTACT WHEEL

IRREGULAR SHAPES



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for the safe collection of dust, fine chips and fumes when processing and finishing non-ferrous metals such as **MAGNESIUM**

PETERS-DALTON *Hydro-Whirl* WET TYPE DUST COLLECTORS

For the proper and safest method of collecting highly inflammable dusts, fine chips and grindings, the Wet Method is BEST. Peters-Dalton Hydro-Whirl Wet Type Dust Collectors are efficient in operation . . . low in price . . . and provide maximum safety to plant and personnel, particularly during what can be hazardous operations, such as grinding, polishing and buffing magnesium alloys.

Illustrated here are four types of PD Wet Type installations. *Upper left*—well ventilated bench for the safe collection of dust produced from portable tool and flexible shaft grinding, polishing and buffing; *upper right* — dust collector for grinding stands and polishing jacks; *lower left* — water-wash type spray booth for removing noxious fumes created while spraying oxidation inhibitors containing fluorides or other toxic compounds on cores; *lower right* — high velocity side hood wet collector for dust, fumes and smoke during a foundry "shakeout" operation.

Whatever your operation, PD engineers can design for you the proper type of Wet Dust Collecting Unit. We will be glad to tell you more—just write, wire or phone.

Now Available: Our informative new brochure for magnesium dust collection and control —

"Wet Method is BEST"

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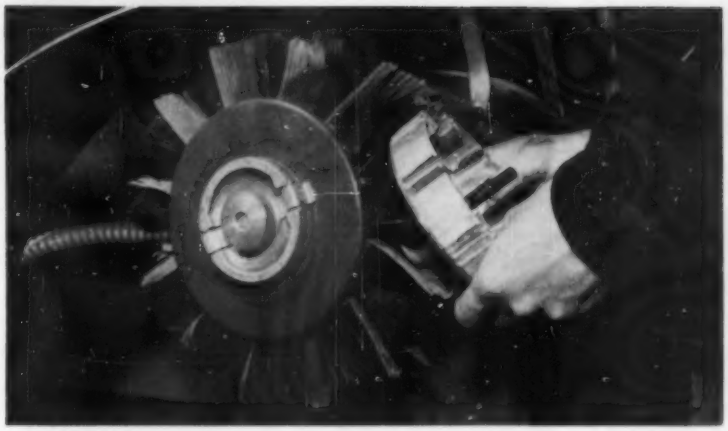

THE SANDER SANDED might be the caption for this photo showing a zinc die casting, produced by Los Angeles Die Casting Co., being deburred by brush-backed abrasive strips held in a die casting like the one being finished.

Abrasive Strip Sander Is Built Of Die Castings

ACCURACY required in a patented, intricately-formed locking device in its Sand-O-Flex contour sander caused Merit Products, Inc. to decide on zinc die casting as the means of production of its major parts. The sander performs more than 22 operations, ranging from deburring metal to cleaning eggs.

Only five metal parts comprise the complete unit and, according to the company, all will last indefinitely under normal treatment. With the exception of a cast-in steel stud and the adjusting bracket and knob, the unit consists of die castings only, which are used without any finish other than surface paint.

The sanding operation is done by a series of abrasive strips placed in slots at equal distances around the wheel, and backed up by small brushes.

The actual design of the various sections of the sander has made die casting of the sections desirable. The slots around the perimeter of the body must be placed at exact distances to insure proper sanding by the abrasive strips. The accuracy of die casting also is reflected in the shoulder fit of the cover on the body. Although the two pieces are cast separately, the cover fits precisely as cast.

One of the important design features of the Sand-O-Flex is its easy reloading of abrasive cartridges. A die-cast adjusting knob fits into the center hole of the cover and, by means of four upright lips, locks into corresponding slots of a paper sleeve. The knob also fits into slots on the pad on the bottom of the body casting, in a circular arrangement around the center hub. The main function of this locking and adjusting device is to enable the user to adjust the lengths of the protruding sand belt ends.

The simplicity of the Sand-O-Flex design cuts abrasive loading time to a minimum. The hand-turned knurled nut locks the cover in place and sets the tension on the abrasive strips. These strips are removed, after becoming worn, by loosening the nut. A new sand cartridge can be loaded by unscrewing the nut and removing the cover. Reloading is accomplished by hand in a few minutes, with no tools required.

The Sand-O-Flex contour sander also plays a part in the die casting industry. It deburrs, polishes, removes tool marks, rust and scale. "Satin" finishes are put on aluminum base alloys, and the machine also is used to sand fenders and body parts.

ONE POWDER!

New Powder Gives One-Dip Brightening

Mirror-bright, iridescent-free surfaces on zinc plate can now be obtained *with* **NO BRIGHTENERS** *in the zinc bath!* This revolutionary process requires just *one* easily handled *powder*, KENVERT No. 16. It is packaged in disposable drums with polyethylene liners, and offers savings up to 50% over previous methods. The new process operates satisfactorily in the temperature range from 90 to 110° F. with no ventilation required, and offers excellent corrosion protection and unusual resistance to staining and fingerprints. Other powders are available for economically brightening and passivating work from bright plating baths.

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CONVERSION CHEMICAL CORPORATION

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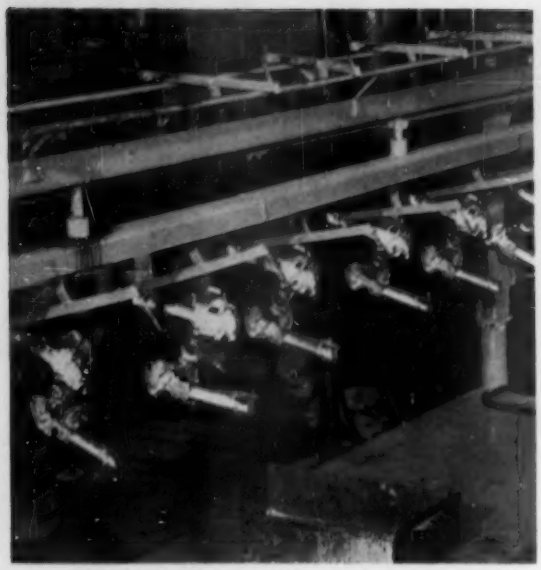
FLASH REMOVAL



CONVEYORIZED castings move to the trim press. Castings are suspended from hooks rather than laid on a belt, to avoid warpage in the short distance (20 feet) to the trim press. This method avoids distortion that would require an extra straightening operation.

TRIMMING PRESS removes gate and flash from the castings. A standard Denison Multipress is used, with trim dies mounted in a standard die set. Since a single cavity trim die is used, two trimming operations are required per gate of castings. Hydraulic presses are used for greater speed and superior action that prolongs die life.

ALL DIE CAST dump trucks, produced by Dardis Mfg. Div. of Richards Tool & Mold Co. are being examined here by D. P. Richards (right), president of the company. How they are finished in production is illustrated in the accompanying photo-story.

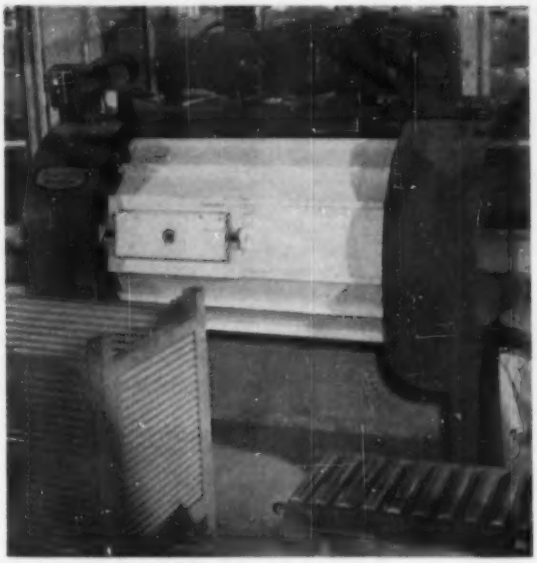
Efficient Finishing . . . Key To Competitive Toy Manufacture

IN few lines of manufacturing is the cost of finishing more closely watched and controlled than in the production of toys. Where competition is so intense, the cost of applying a colorful coating may be the difference between profit and loss. Certainly finishing is a major factor in the cost of toys, and the methods for applying finish to toys is often a closely guarded secret.

While die cast toys . . . guns, trains, automobiles, etc. . . . have a natural advantage over molded plastic because of the greater strength and durability of the metal, the integral color obtained by molding is a tough economic advantage to overcome. Yet many manufacturers of die cast toys have introduced conveyorized systems, have installed bulk finishing techniques, and have cut finishing costs to a competitive level.

Shown here are some of the methods employed by one Mid-Western toy manufacturer, Dardis Mfg., Inc., a division of Richards Tool & Mold Co., in Racine, Wisc.

BARREL PROCESSING



BARREL DEBURRING and burnishing are done by using 30 lbs. of ¼" steel balls dry in this Almco barrel with 200 lbs. of castings. Barrel lining is Neolite. No compound is used for the 20-minute cycle. Experience has shown that barrel and balls must be cleaned weekly with a water solution of a detergent in the barrel and with kerosene or paint thinner to clean the balls.

TILTING BARREL is used for finishing the smaller parts. Here, neither balls nor media are used, and deburring is accomplished by a self-tumbling action of castings rubbing against each other. Charge size, cycle time and speed of rotation depend upon the character of the parts being processed. Barrel is nearly always filled to the maximum.

PAINT SPRAY FINISHING

SPRAY PAINTING is done directly on the barrel finished surface. Enamel adheres to the die cast surface without pre-treatment, provided that the barrel is kept clean. DeVilbiss guns and auxiliary equipment are used. At this stage, no attempt is made to mask or otherwise selectively decorate surfaces of the zinc die castings.

INDIVIDUAL DECORATION is done with spray gun and hand-held paint spray masks. All lettering, striping and other color treatments are applied here. Although the basic paint coat is baked for seven minutes at 310 F, the secondary color is allowed to air dry. Maximum of two colors is used on any one component.

PEOPLE

continued from page 24

Kirby F. Thornton has been appointed assistant manager of *Aluminum Company of America's* New Kensington, Pa. sales development division. He was formerly chief engineer of the New Kensington division.

Morton B. Gilbert, formerly a sales engineer for the *F. J. Stokes Corp.'s* Chicago district, has been named to the Stokes headquarters staff as a product specialist.

Charles G. Chisholm, formerly sales development manager for investment castings, has been appointed general sales manager of *Haynes Stellite Co.*, a division of *Union Carbide & Carbon Corp.*

Don O. Noel, who was employed by *Metals Disintegrating Co.* from 1929 to 1948, has returned to MD to serve as assistant to the president.

M. G. Halsey is the new vice president in charge of the *Glidden Co.'s Chemicals - Pigments - Metals Div.*, succeeding **John P. Ruth**, who has retired. Mr. Halsey was previously manager of Glidden's Baltimore plant.

Besides this 3/16" diameter size of Tumblex "S" you can order it in four other sizes, up to ¼". This means top barrel-finishing performance for you, in many different applications. And these new spheres are exceptionally dense and long-lasting.

Norton ALUNDUM* Tumblex "S" Spheres

Another big advance in barrel-finishing

Tubing, coil springs, scissor handles, bearing retainers, pump bodies and many other parts have recesses or intricate shapes that are hard to contact in finishing. You can finish them faster and better with ALUNDUM Tumblex "S" abrasive because:

Tumblex "S" is made in spheres that easily get into areas where other abrasive shapes can't reach . . . It comes in five different diameter sizes: #2, 1/8"; #3, 5/32"; #4, 3/16"; #5, 1/4" and #6, 5/16", covering a big range of parts to be barrel-finished . . . Made of famous Norton ALUNDUM abrasive, it cuts fast — resulting in shorter time cycles and lower costs per piece finished.

Send your work samples to our Sample Processing Department. Learn how Tumblex "S" abrasive can bring the value-adding, cost-cutting "Touch of Gold" to your barrel-finishing operations. NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone book, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

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*Trade Mark Reg. U. S. Pat. Off. and Foreign Countries

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ABRASIVES
Making better products... to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING PRODUCTS: Coated Abrasives • Sharpening Stones • Behr-cut Tapes

Joe Farmer has been named assistant to the president of *Greenback Industries, Inc.* He will be in charge of the company's new laboratory in Birmingham, Mich.

Dr. R. Wayne Parcel has been appointed chief metallurgist of *Dalmo Victor Co.* He will act as company consultant on all metallurgical problems relating to materials and processes and will organize and administrate a metallurgical laboratory.

Todd W. Fredericks has been named general sales manager of *Centr-O-Cast & Engineering Co.*

The appointment of **Baboo Ram Taree** as chief engineer of *Greer Hydraulics, Inc.* has been announced.

Arthur E. Hills has been appointed sales and service representative in northern Ohio for *Hitchiner Mfg. Co.*

Dr. Harold J. Dawe has been appointed technical staff consultant of *Acheson Industries, Inc.* He will supervise technical activities at all seven Acheson plants in the United States, England, and Holland. Prior to this appointment, Dr. Dawe served as research and development director for *Acheson Colloids Co.*, and he will continue this work until a successor is appointed.

Administrative managers in four departments of the *Light Metals Div. of Thompson Products, Inc.* have been appointed. **Carl W. Haydl**, assistant to the division manager, takes on the additional title of administrative manager of aircraft machining. **John Stobbs**, formerly a metallurgical engineer, has become administrative manager of the foundry department. **Dean Garrett** has moved from sales engineer to administrative manager in the piston machining department, and project engineer **Bill Reinberger** has become acting administrative manager in the extruded products department.

Lawrence W. Cunningham has been named Dallas district sales manager for *Kelite Corp.*

O. Jay Myers has been appointed vice president in charge of the Foundry Div. of *Reichhold Chemicals, Inc.*

Clyde E. Lowe has been promoted to Detroit district manager for *Cowles Chemical Co.*

S. Sydney Minault has been named vice president of *National Research Corp.* He will be in charge of development, engineering, production, and sales of the company's line of industrial processing equipment.

ASTE TO CELEBRATE SILVER ANNIVERSARY

The 35,000-member American Society of Tool Engineers will celebrate its silver anniversary in March with a special commemorative program at its annual meeting in Houston, Tex.

A special program, including nearly 40 technical sessions, symposiums and panels dealing with pertinent industrial topics will highlight the three-day meeting at the Shamrock Hilton hotel. The program opens March 25.

MARTIN MANAGER NAMED

Richard Owen has been appointed general manager of the Martin Grinding and Machine Works, Inc., according to James F. Rice Jr., president. Mr. Owen succeeds William B. Grant, who resigned in October.

NEW PLANT OPENED

Federated Metals of Canada, Ltd., has opened its second new non-ferrous metal fabricating, processing, and refining plant in Canada. Located in the Montreal suburb of Lachine, the plant is on a nine-acre tract and has 40,000 square feet of floor space.

GAINES CO. MOVES

The Gaines Co. of Los Angeles has moved into a new plant with the second largest aluminum and magnesium casting production capacity in the area. Located at Riviera, Calif., the plant covers 30,000 square feet of floor space on an acre and a half of ground.

In addition to the castings operations, the new plant includes a complete tool and die shop, and a production machine shop which permits the company to supply its customers with machined cast parts ready for assembly.

CUT ZIRCONIUM PRICE

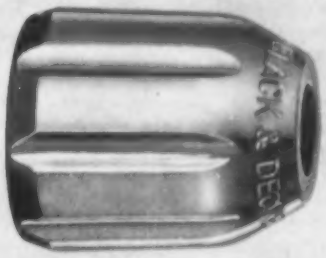
Zirconium Corporation of America has announced a major price adjustment which cuts the cost of pure zirconium oxide by 25 percent and paves the way for economical super refractory application of stabilized zirconia with reductions ranging up to 25 percent.

Zircoa, which specializes in production of pure and stabilized Zirconia and custom molded shapes, is the only firm in the country producing stabilized oxide with a continuous process.

now you can get this brilliant finish directly on zinc die castings!

PART AS CAST

No electroplating--no mechanical finishing!



TREATED WITH NEW IRIDITE

NEW IRIDITE® (Cast-Zinc-Brite)

brightens zinc die castings by chemical polishing, protects against corrosion

NOW, FOR THE FIRST TIME you can get a brilliant, decorative finish directly on zinc die-cast parts . . . without mechanical finishing, without electroplating! The luster is provided by the *chemical polishing* action of new Iridite (Cast-Zinc-Brite) solution. Even surface blemishes, such as cold shuts, are brightened by this new process. No electrolysis. No special equipment. No specially trained personnel. Just a simple chemical dip for a few seconds and the job is done. And, this new Iridite has been *tested and proved* in production.

CORROSION RESISTANCE, TOO! New Iridite (Cast-Zinc-Brite) provides exceptional corrosion resistance for bright-type chromate finishes . . . also guards against blueing or darkening by eliminating zinc plate formerly required in bright chromate finishing of zinc die castings.

AS A BASE FOR ELECTROPLATING—Lower mechanical finishing costs are possible where plated finishes are *required* since the brightness provided by this new Iridite may be sufficient.

LET US SHOW YOU what Iridite (Cast-Zinc-Brite) can do for you. Send us at least a half-dozen typical zinc die-cast parts for FREE PROCESSING for your own tests and evaluation. Or, for immediate information, call in your Iridite Field Engineer. He's listed under "Plating Supplies" in your classified 'phone book. *IMPORTANT: when you give us samples for test processing, please be sure to identify the alloy used.*

Iridite is approved under government specifications

ALLIED RESEARCH PRODUCTS
INCORPORATED
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Manufacturers of Iridite Finishes for Corrosion Protection and Paint Systems on Non-Ferrous Metals; ASTM Plating Classes

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GUN SIGHT

continued from page 47

pendicularity are important. Here again investment casting shows its superiority. When the pattern die is properly and accurately made, these critical factors are permanently fixed so that duplication from piece-to-piece is of very high order.

CORROSION RESISTANCE: By manufacturing the sight of a good grade of steel and later applying a black oxide finish, a surface is developed that is extremely resistant to almost any atmospheric condition to which the gun may be subjected. A properly cared for gun will always have a very thin film of oil on all of its exposed parts. This oil film, in combination with the black oxide surface, gives completely permanent protection to the sight.

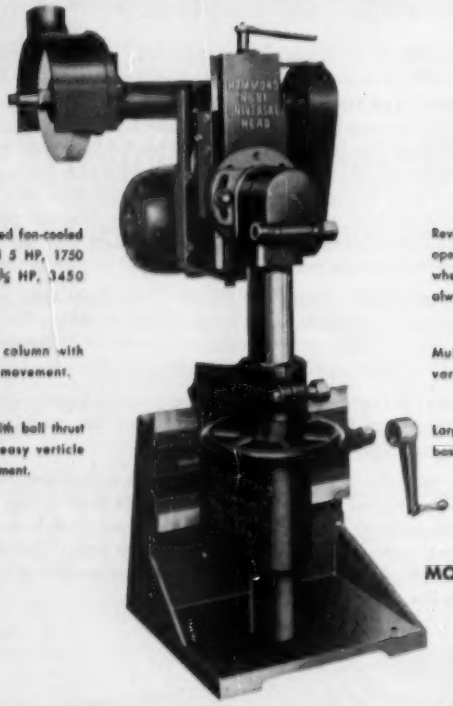
RESISTANCE TO ABUSE: Any field gun, no matter how carefully handled and well cared for will be subject to some bumping, jarring and other physical mistreatment. By making the sight of a hardenable steel, the sight can be hardened and tempered to secure just the right combination of hardness and toughness so that under all normal conditions of field use the gun will retain its accuracy, at least as far as constancy of the sight is concerned.

COSTS: As mentioned, a sight such as the one illustrated could be machined from wrought stock. Originally, this sight was made in this way, but had, of necessity, to be priced so high that sales were limited. By converting to an investment casting, the manufacturing costs were cut by over 40 percent.

But lowered manufacturing costs are not the only dollar advantage that have come with the change to investment casting. Production rates have been greatly increased, tooling costs practically eliminated, special machine tools that would have been needed were not purchased and available man power was diverted to other work so that more employees did not have to be hired and trained.

Hammond of KALAMAZOO

FOR THE RIGHT FINISHING HEAD



Totally enclosed fan-cooled motor (3 and 5 HP, 1750 RPM and 7½ HP, 3450 RPM).

Sturdy steel column with 14" vertical movement.

Handwheel with ball thrust bearing for easy verticle column adjustment.

Reversible ratchet wrench operated dovetail slide feeds wheel to work on "once set-always set" angled head.

Multi-V-belt drive permits various spindle speeds.

Large, extra heavy cast-iron base with anchor bolt holes.

MODEL 50-81

1½ HP to 25 HP — Floating or non floating types for use with buffs, wire or tampico brushes or abrasive belts. Accessories include AIR LIFT — POWER WHEEL FEED — POWER TRAVEL (VERTICAL OR HORIZONTAL) OSCILLATING SPINDLE. Tell us your problem and let us quote on your requirements.

Hammond Machinery Builders INC.

1642 DOUGLAS AVENUE KALAMAZOO, MICHIGAN

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NEW COMPANY FORMED

A new company to produce air and hydraulic cylinders has been formed in Cudahy, Wisc., a Milwaukee suburb. Called the Hydair Cylinder Corp., it will produce cylinders specially designed for heavy-duty service to meet specialized requirements of the automotive and machine tool industry.

HELI-COIL BECOMES TOPP SUBSIDIARY

Topp Industries, Inc., Los Angeles electronics and instruments firm, has purchased the assets of Heli-Coil Corp., Danbury, Conn., according to B. F. Gira, Topp Industries president. The purchase is part of a three-way merger in which the assets and sales of Haller, Raymond, and Brown, Inc. were also acquired by Topp.

Primary products of Heli-Coil are thread inserts used in applications requiring strong threads for bolts and screws in soft materials such as aluminum, magnesium, and plastics. Haller, Raymond, and Brown is the Topp electronics research and development subsidiary.

ETTCO TOOL EXPANSION BRINGS NAMES CHANGE

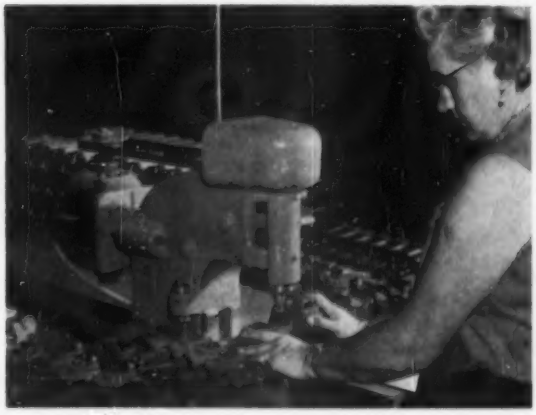
Ettco Tool and Machine Co., Inc. is the new name for the 45-year-old Brooklyn N. Y. manufacturer of Ettco-Emrick drilling and tapping equipment. The longer name better describes the scope of the company's products, according to Melvin H. Emrick, president.

Ettco now builds a complete line of standard and special machines for small hole drilling and tapping, as well as its older tool and attachment lines. Plant facilities have been doubled over the past year to handle its larger production volume.

TOY FINISHING — continued from page 57

MACHINING AND ASSEMBLY

HIGH-SPEED ASSEMBLY brings together all of the painted components and the sub-assemblies of small castings. By means of such devices as integrally cast rivets, Speed Nuts and other rapid means, maximum rate of assembly is achieved. Wherever possible, assembly is done by using air-operated presses with special holding fixtures.



DRILL PRESS is used to machine holes for self tapping screws. Since not all models require the added equipment that is fastened by these screws, it is undesirable to core, drill or punch the holes as a standard part of the preliminary operations. Following this final operation, only the attachment of the screwed-on piece and packaging remains to be done.

In addition to being able to compete, economically, with toys made of molded plastics, zinc die castings have another outstanding advantage. The grade of plastic generally used fo. this type of toy is quite hard and brittle. Even minor impact will cause fracture of the plastic leaving sharp edges and piercing points that can well injure the child playing with the toy. Under very severe impact, a zinc die casting is more liable to bend or dent than to break. Thus zinc die castings contribute materially to lessening accidents to children.

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ABRASIVE TUMBLING BARRELS

never need babying, even on the toughest jobs. You can count on uninterrupted production, long life and low upkeep. They're truly heavy-duty, with extra-rigid welded-steel drums, oversize self-aligning bearings, plus power to spare. They give higher production rates with their low loading heights, large unobstructed door openings, quick-locking safety doors, and safe accessible controls.

All ESBEC barrel finishing equipment offers practical, profit-producing features based on first-hand experience in our own, and other finishing plants. **Write for catalog today!**

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Sel-Rex **Precious Metal Processes for Industrial Applications**

Sel-Rex BRIGHT GOLD deposits are more dense and twice as hard. Give mirror bright finish directly from the bath — eliminates costly scratch brushing, buffing and burnishing.

Sel-Rex BRIGHT RHODIUM meets the needs of today's precise engineering applications with A.S.C. — Automatic Stress Compensation — a special technique which counteracts the high stress characteristics of conventional rhodium electroplates.

Sel-Rex Silver SOL-U-SALT (Non-dusting) is added directly to the plating bath, eliminating time consuming filtering or mixing.

Write for descriptive literature and technical data.

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USEFUL LITERATURE, CATALOGS, MANUALS

any of these technical publications may be obtained by circling the appropriate numbers on the Reader Service Cards, Pages 16-17

PMM PROCESSES

Shaw Casting Process: 154
Shaw Development Corp., 28-page booklet. A review of the developments and applications of the Shaw process of precision casting is presented in an illustrated booklet. The Shaw process, perfected in England, incorporates a flexible mold and claims precision investment castings similar in accuracy and finish to lost wax casting.

Copper Base Alloy Casting: 155
Pressco Casting & Mfg. Corp., 28 pages. This illustrated booklet explains the company's process in the production of sand castings, die castings, investment castings, permanent and semi-permanent mold castings. Design, size limitations, tolerances, alloys, applications, advantages and disadvantages are discussed.

Precision Impellers: 156
Universal Castings Corp., 2-color folder. Seven examples of complex-blade aluminum impellers are illustrated, showing how the company's low temperature pouring with applied vacuum produces castings with sound metal structure, high physical properties, guaranteed minimum tensile strength and 100 percent X-ray and aircraft requirement approval.

Precision Die Castings: 157
Precision Casting Co., Two 2-color folders. Photographs and information on the variety of die cast products manufactured by the company are presented. A description of the company's design and engineering service is included.

Titanium Casting Development: 158
Howard Foundry Co., illustrated folder. Titanium casting development work by the company's titanium casting subsidiary is described. An arc-metal vacuum furnace capable of pouring 50 pounds of titanium per charge is pictured, and a table of average physical properties of titanium alloys is presented.

Shell Mold Applications: 159
General Motors Corp., 6 pages, 2-color brochure. The use of shell mold castings in GM's Central Foundry Div. is described and illustrated. Comparisons between this process and green sand casting are given, and a bibliography is included.

Plaster Mold Castings: 160
Universal Castings Corp., 2-color folder. Alloys available and design considerations are discussed regarding the use of plaster-mold castings. A table of typical physical properties of casting alloys is included.

Non-Ferrous Shell Casting: 164
Lakeside Bronze Inc., 8-page booklet. This 2-color booklet is a quick reference source to 22 non-ferrous alloys used by the company for the manufacture of sand and shell mold castings. A brief description, chemical composition, physical properties, and equivalent Federal, Navy, S.A.E. and A.S.T.M. specifications are given for each alloy.

Fluid Flow Castings: 162
Morris Bean & Co., illustrated folder. Utilizing a mold material which reportedly combines the advantages of sand and gypsum, the Antioch process of aluminum casting is explained. This process is used for castings used in the movement and control of gases and liquids.

Impact Mold Process: 163
Bronze & Steel Die Casting Co., 2-color reprint. Announcing a new permanent mold process, the bulletin describes the company's "impact molded" aluminum-bronze castings. X-ray results and a table of physical properties on the alloy and the process are included.

Foundry Facilities: 161
Bendix Aviation Corp., 2-color folder. Engineering, production, and quality control facilities of the company's Foundries Division are described. The company produces sand, die, plaster, and permanent mold castings in magnesium and aluminum alloys.

MATERIALS AND EQUIPMENT

Immersion Heating, Melting: 165
C. M. Kemp Mfg. Co., 12 pages. Bulletin IE-11 discusses the history, advantages, and applications of gas-fired immersion heating and melting. Explaining the importance of the carburetor in immersion heating, the bulletin describes the company's models in two series. Models of Kemp immersion heating pots are also described and illustrated.

Pocket Guide To Die Casting: 166
Henning Bros. & Smith, Inc., 32 pages, 2-color brochure. A pocket-size guide for die casting machine operators, the booklet discusses the many factors which influence the production of sound zinc alloy die castings with good surface finish. Included is a section on how improper casting techniques affect the finished part, and typical casting defects are illustrated.

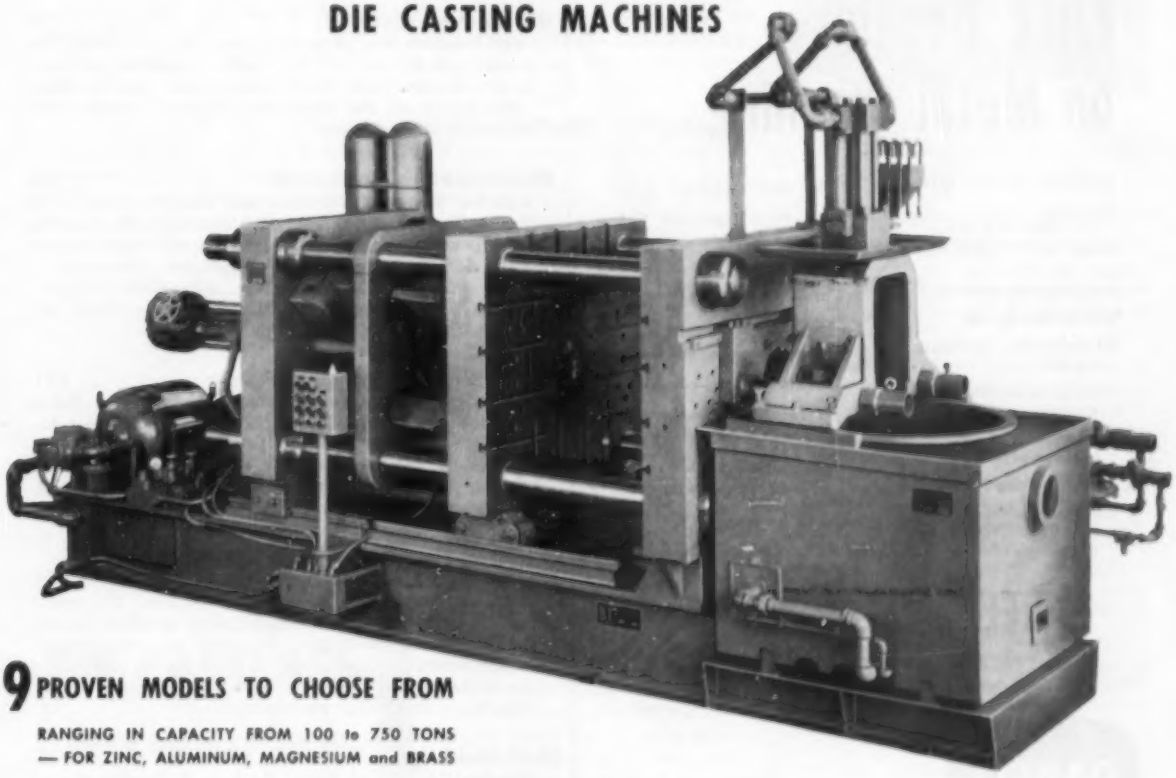
Vacuum Processing Data: 172
F. J. Stokes Corp., 26 pages, 2-color catalog and data book. Information helpful to engineers confronted with vacuum processing problems plus new specifications for the company's line of mechanical vacuum pumps are contained in catalog 752. Among the data offered are tables of formulas, constants, and conversion factors frequently used in vacuum processing, solutions to pump selection problems for typical vacuum systems, and useful information on continuous oil purification and other maintenance procedures for high vacuum pumps.

Industrial Furnaces: 174
Surface Combustion Corp., 8 pages, 2-color catalog. Twenty-seven of the company's line of standard rated furnaces for all types of industrial heating applications are described in Bulletin SC-175.

Continued on page 64

B&T DIE CASTING MACHINES

DESIGNED AND BUILT TO THE SPECIFICATIONS OF PRACTICAL, LONG-TIME DIECASTERS AND DEVELOPERS OF DIE CASTING MACHINES



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RANGING IN CAPACITY FROM 100 to 750 TONS
— FOR ZINC, ALUMINUM, MAGNESIUM and BRASS

B&T die casting machines operate with four extra heavy alloy steel casting toggles that lock directly under the tie bars. The hydraulic lines are of extra heavy seamless pipe; Weldon joints, flanged connections and "O" ring seals on pressure lines. Full specifications on all models furnished upon request. Consult with us on your requirements.

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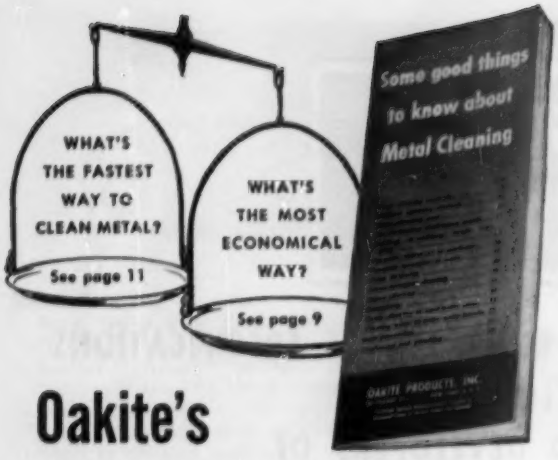
WHAT'S THE FASTEST WAY TO CLEAN METAL?
See page 11
WHAT'S THE MOST ECONOMICAL WAY?
See page 9
Some good things to know about Metal Cleaning
OAKITE PRODUCTS, INC.

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answers many questions that mean better production, more profit for you. Just look at the table of contents:

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- Electrocleaning nonferrous metals
- Pickling, deoxidizing, bright dipping
- Applying iron phosphate coatings in preparation for painting
- Applying zinc phosphate coatings
- Cleaning, removing rust and conditioning for painting in one operation
- Machine cleaning methods
- Paint stripping
- Steam-detergent cleaning
- Barrel finishing, burnishing
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USEFUL LITERATURE

continued from page 62

Mechanical Booster Pumps: 167
New York Air Brake Co., Kinney Mfg. Div., 2-color folder. A descriptive catalog on the company's Model KMB 1200 two-stage vacuum pump. Pumping speed, pressure and horsepower curves are illustrated and data on all pump models is given.

Temperature Control for Casting: 168
Minneapolis-Honeywell Regulator Co., 20 pages. An index of literature published by the company's industrial division, catalog G-2 includes instrumentation data sheets on molten aluminum casting; molten brass, bronze, and copper temperature measurement; die casting temperature control; and temperature control of Reed-Prentice die casting machines.

Die Casting Machine: 169
Unit Products Div. of Uniloy Corp., 3-color folder. The company's Model 120 die casting machine for zinc alloys is described, with specifications and detailed photographs of the simplified hydraulic system and injection end included.

Quantometers Compared: 170
Applied Research Laboratories, illustrated technical folder. The company's new ARL Quantograph, utilizing both parallel and sequential systems of direct reading plus a spectrograph for photographic recording, is described and illustrated. Four differences in comparing the sequential with the parallel systems are evaluated and discussed.

Fire-resistant Hydraulic Fluids: 171
Carbide and Carbon Chemicals Co. Div. of Union Carbide and Carbon Corp., 12 pages. This two-color booklet presents in condensed form information on the company's line of hydrolube safety hydraulic fluids. Among the subjects treated are typical properties, laboratory pump test data, fire resistance, limitations, installation and maintenance, and control.

Die Casting Machine Manufacturing: 173
A. Triulzi S.A.S. 26 pages, 5-color booklet. The company's die casting machine plant and its facilities are described and illustrated. Included are descriptions of the technical department, manufacturing and service facilities. The book is illustrated with both black-and-white and color photographs.

Shell Molding: 175
Bakelite Co. div of Union Carbide & Carbon Corp. 32 page magazine. The October issue of the "Bakelite Review" contains a report on the use of shell mold castings in the manufacture of cast aluminum fence fixtures. Reasons for the use of the company's phenolic resins in the molds are given.

Laboratory Vacuum Furnace: 179
Vacuum Equipment Div. of New York Air Brake Co., 4 pages. A laboratory vacuum furnace designed for a wide range of laboratory vacuum problems is described. Known as the model F-15, it can be supplied with either resistance or induction heating. It is shown in combination with a PW-400 packaged pumping system made by the Optical Film Engineering Co. and a 7½ KVA low voltage packaged power supply.

Continued on page 76

LETTERS

continued from page 26

851 issued on July 8, 1943 covering this development. We are calling your attention to this in the hope that you will see fit to print a clarifying statement.

It should be pointed out that this patent actually covers the process of making a casting by means of the water-soluble wax technique, and not simply the material employed.

We feel certain that any misimpression created was an inadvertence.—C. A. Cerami, Mgr. of Legal Activities, Austenal Laboratories, Inc., 224 East 39th St., New York 16, N. Y.

We were not aware of the patent situation with regard to this method, nor was our author, W. A. Dubovick. His particular article was only intended to show a method of handling water soluble wax on a commercial basis for producing parts that would be almost impossible otherwise. However, we certainly do not wish to create a misunderstanding, and are pleased to print Mr. Cerami's letter here.—Ed.

VACUUM DIE

continued from page 48

An electrical interlock then releases, energizing downward movement of the metal injection plunger, which injects the molten metal into the die under high pressure and speed.

After pre-set cooling time, the plunger retracts, the die opens and the casting ejected. Ejector pins return to back positions and the die is ready for another cycle.

Only difference in cold chamber model operation is the necessity for the operator to hand ladle metal into the injection well, after which the plunger slowly moves forward closing the inlet pouring hole prior to air evacuation from the die.

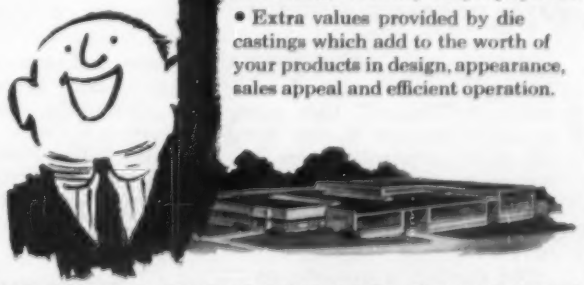
NEW COMPANY FORMED

A new company to produce air and hydraulic cylinders has been formed in Sudahy, Wisc., a Milwaukee suburb. Called the Hydair Cylinder Corp., it will produce cylinders specially designed for heavy-duty service.

You Get EXTRA VALUES

— when you Specify
DIE CASTINGS
by
MILWAUKEE

- Extra values provided by the modern Milwaukee plant with every facility for Complete Die Casting Service.
- Extra values provided by more than 45 years of continuous service to industry in producing precision die cast parts for all types of assemblies from small intricate instruments to heavy-duty equipment.
- Extra values provided by die castings which add to the worth of your products in design, appearance, sales appeal and efficient operation.



Milwaukee operates under the Certified Zinc Plan of the American Die Casting Institute.

MILWAUKEE DIE CASTING COMPANY
4146 N. HOLTON STREET • MILWAUKEE 12, WISCONSIN
Established 1909

For more information circle No. 44 on the Reader Service Card

NEW
Luster-on®
52 POWDER

PROTECTS and BRIGHTENS ZINC at LOWEST COST YET

LUSTER-ON 52 POWDER *is a low, low priced single dip, no-leach conversion coating for zinc plated surfaces.*

LUSTER-ON 52 POWDER was recently developed by The Chemical Corporation for automatic equipment where facilities are not available for added leaching and rinsing.

LUSTER-ON 52 POWDER gives a bright bluish hue; provides lasting corrosion protection against staining, tarnishing and white powder products.

LUSTER-ON 52 POWDER can *now* be used in cases where cost has prohibited use of chromates in the past. For instance, electrical conduit, conduit boxes, screws and builder's hardware, tools, electronic parts, air conditioning parts, automotive parts, cheap toys.

LUSTER-ON 52 POWDER is not only low, low in price, but eliminates expensive handling, space-consuming storage and carboy deposits.

Still available, of course — time-tested Luster-On liquid dips and coatings for all your needs.

Data Sheets and Prices on Request. Send in part for free processing.

West Coast: Crown Chem. & Engr. Los Angeles & San Francisco
Canadian Licensee: Alloycraft Ltd. Montreal

THE Chemical CORPORATION
66 Waltham Ave. • Springfield 9, Mass.
Circle No. 71 on Reader Service Card

NEW PRODUCTS AND DEVELOPMENTS

Want complete details on these announcements? Use the Reader Service Cards. You'll find them facing page 16 of this issue

CONTOUR & SURFACE PROJECTOR FOR SMALL PART INSPECTION

A new low-cost contour and surface projector called the Magnavisa has been announced. Designed as a self-contained portable projection magnifier, it is suited for inspection and examination of relatively flat objects and small parts, imprinted circuits, fine print on small scale drawings, etc.

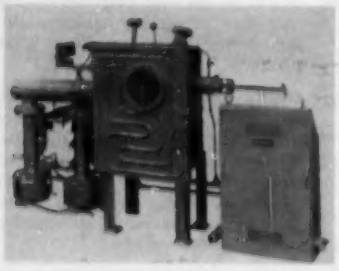
Material to be examined is placed on a two-way movable platform. When the counterbalanced optical head is lowered, the magnified image is projected onto a uniformly illuminated 4½ x 12 inch viewing screen.

Movements of the magnified image on the screen appear in the same directions as the object.

Additional areas of the object can be examined by moving the platform in the desired direction. Movement of the magnified image on the screen appears in the same direction as the object.

American Optical, Instrument Div.
For more information, circle No. 206 on the Reader Service Card

VACUUM FURNACE FOR FAST-CYCLE PRODUCTION



A new vacuum furnace designed for precision casting operations is capable of melting and pouring single casts of five to 17 pounds under vacuum as low as two microns.

The new furnace, model 437-520, is a relatively low cost unit designed primarily for economical fast-cycle production by either investment or permanent mold procedures. It can also be modified for use as a refining furnace.

Advantages claimed for the unit include: smooth pouring, good visibility, ease of operation, can be readily set up for uniform, repetitive pre-determined melting and pouring cycles, and accurate control over pouring temperatures.

Overall dimensions are 6'10" wide and 7'3" deep.

F. J. Stokes Corp.
For more information, circle No. 205 on the Reader Service Card

INDIRECT ARC FURNACE HAS WATER-COOLED ELECTRODE

An economical indirect 20 KVA 20-pound capacity arc furnace featuring "Zirconal" high purity alumina crucibles is now being offered. A standard pattern conversion type indirect arc furnace, it is similar to that used by precision investment casting foundries.

The furnace is powered at 95 volts by a 20 KVA transformer which is separate from the furnace and, mounted on casters, can readily be moved.

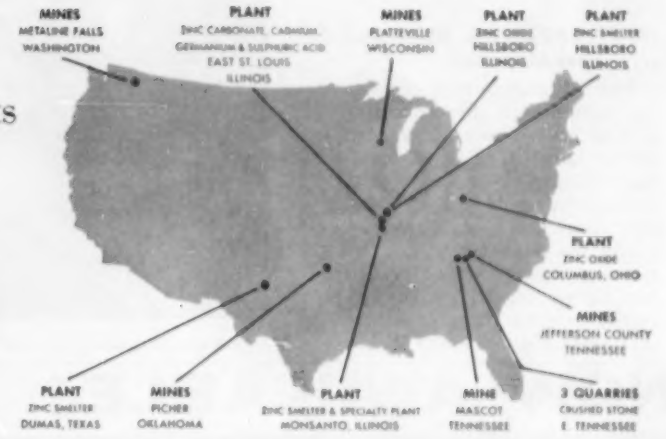
One of the most important features is the water cooled electrode with both coarse and fine hand adjustment. Little more than a trickle at ordinary waterline pressure is required for the cooling.

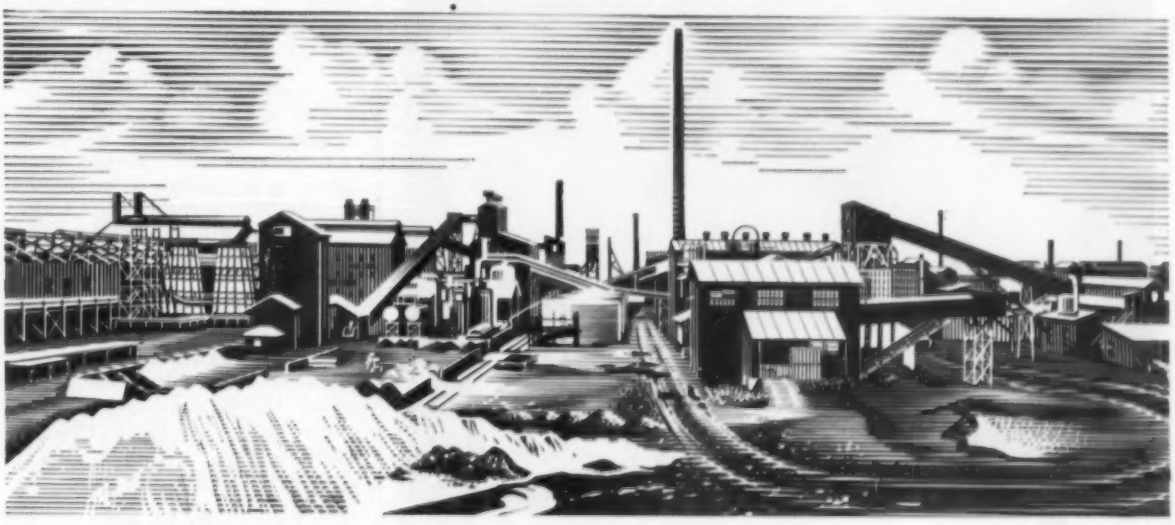
British Industries Corp., International Machinery Div.
For more information, circle No. 207 on the Reader Service Card

More New Products on page 68

American inc and its products

from A *to* Z





FAIRMONT CITY, ILLINOIS
(East St. Louis)

Operations include: roasting and sintering of zinc concentrates; cadmium plant producing commercial balls, sticks and plates; zinc carbonate plant; germanium plant producing germanium dioxide for the electronics industry. Sulphuric acid is produced by both the Chamber and Contact methods. For complete picture of American Zinc operations, see map above.

PRODUCERS OF

ALL GRADES OF SLAB ZINC
ZINC ANODES (Plating & Galvanic)
METALLIC CADMIUM
SULPHURIC ACID
LEAD-FREE and LEADED ZINC OXIDES
ZINC CARBONATE
GERMANIUM DIOXIDE
AGRICULTURAL LIMESTONE
CRUSHED STONE

American Zinc sales Company

Distributors for

AMERICAN ZINC, LEAD & SMELTING COMPANY

Columbus, Ohio • Chicago • St. Louis • New York • Detroit • Pittsburgh

For more information circle No. 10 on the Reader Service Card

HEAT TREATING FURNACE
. . . uses induction

Two completely new engineering features are offered in a new type of heat treating furnace recently unveiled. Called the Induct-O-Ring, it is designed for carbonitriding, bright hardening, and carburizing of small parts.

For the first time in a heat treating furnace, the induction heating principle is used. This makes possible the elimination of heating elements, element terminals, burners, gas or electric connections in the furnace.

The novel circular shape is claimed to eliminate the usual heat and atmosphere losses occasioned when conventional furnace doors are opened. Material saving in floor space is also accomplished by the circular shape.

Lindberg Engineering Co.
For more information, circle No. 208 on the Reader Service Card

SCALE MEASURES
. . . up to .0001

A measuring scale available in lengths up to 12 inches and capable of accurate measurements up to .0001 has been announced. Called an EMscale, it can be made from many materials.

In work where thermal expansion must be considered, the scale can be furnished on material identical to that being measured to eliminate the necessity for temperature control in the working area.

The scale is graduated in thousandths of an inch. By using a microscope with a vernier eyepiece, it is possible to get readings to .0001 over the entire scale.

Elliott-Myers Corp.
For more information, circle No. 210 on the Reader Service Card

TOGGLE MECHANISM
. . . is larger, stronger

A new toggle mechanism has been designed for the small high-speed DCMT die casting machines. Interchangeable with all existing units, it features a more massive air cylinder, stronger and larger ejector box, and heavier duty toggle links.

Links are manufactured from hardened tool steel, and the pins, somewhat softer, are held in place by Truarc rings. They are designed so that any wear would occur on the toggle pins which are easily and readily replaced.

British Industries Corp., DCMT Div.
For more information, circle No. 220 on the Reader Service Card

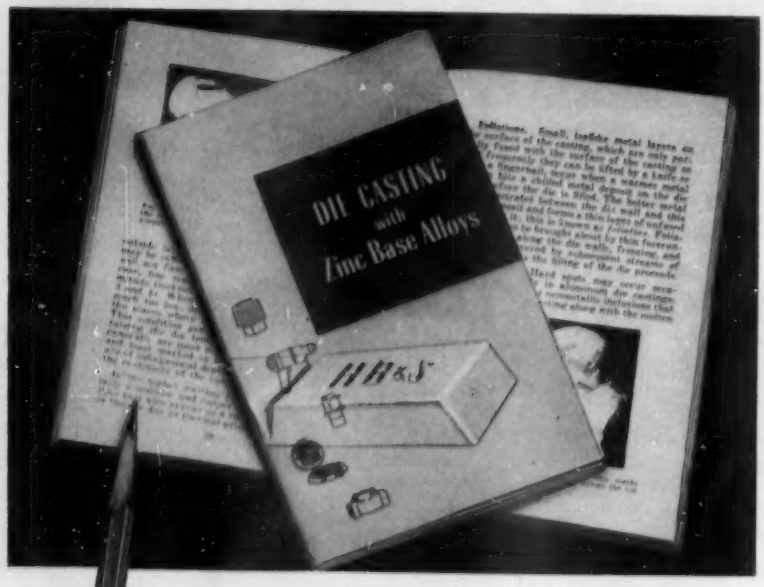
AIR CYLINDER
. . . of stainless steel

A single acting, spring return air cylinder which can be used for such operations as clamping, moving, holding, ejecting and pushing is being offered.

The new cylinder, the model 091, features a vinyl "U" cup mounted in an aluminum alloy piston slide within a stainless steel body. The inside finish of the body is reported to be better than 10 micro inches.

Bimba Hardware & Mfg. Co.
For more information, circle No. 212 on the Reader Service Card

NOW AVAILABLE!



NEW HENNING
pocket guide to better casting

A wealth of helpful data made up in convenient reference form by HB&S as a free service to plant managers and die casting machine operators in industries using zinc base alloys.

Entitled "Die Casting with Zinc Alloys", this booklet is typical of the "extras" you get from Henning Bros. & Smith: spectrographic analysis of heats to assure purity; identifying number on hot bar pallets; heat number on every ingot; alloys that are specifically engineered and laboratory controlled to meet exact specifications.

So, if your design . . . your product calls for casting, turn to HB&S for service, extra service, "dependable service since 1922"!

Write TODAY for our new booklet 5287, "Die Casting with Zinc Alloys". No charge. No obligation.

HENNING BROS. & SMITH, INC.

91-117 Scott Ave., Brooklyn 37, New York

SMELTERS AND REFINERS OF ALUMINUM, BRONZE, BRASS, ZINC, LEAD

For more information circle No. 32 on the Reader Service Card

SPRUE, STRAINER COMBINED . . . for shell casting

A combination sprue and strainer for shell molding has been announced. It incorporates the strainer in the drag half of the shell by attaching a strainer basin to the drag pattern.

With the combination of the sprue in the cope half and the drag half incorporating the strainer feature, the strainer is an integral part of the mold.

Advantages claimed for this feature include: elimination of making or purchasing strainer cores and saving of associated handling expense, elimination of sand fins in strainer core holes and loose sand grains on strainer cores, positive metering of poured metal and prevention of slag entering the mold cavity, elimination of removing strainer cores from return stock, and elimination of the possibility of an omitted or incorrect strainer core.

Shell Process Inc.
For more information, circle No. 216 on the Reader Service Card

DIE LUBRICANTS . . . to prevent sticking

Two new die casting die lubricants have been developed to meet the requirements for the lubrication of dies used in the casting of all alloys.

Known as Duxel "DS" and "DP", they are claimed to eliminate "soldering" or "sticking" of metal alloys and enable the most complicated castings to be easily removed from the steel die.

The "DS" lubricant is in the form of a liquid that can be either brushed or sprayed on the die; "DP" is a paste that can be applied with a brush or spatula.

Duxel Verkaufsgesellschaft m.b.H.
For more information, circle No. 211 on the Reader Service Card

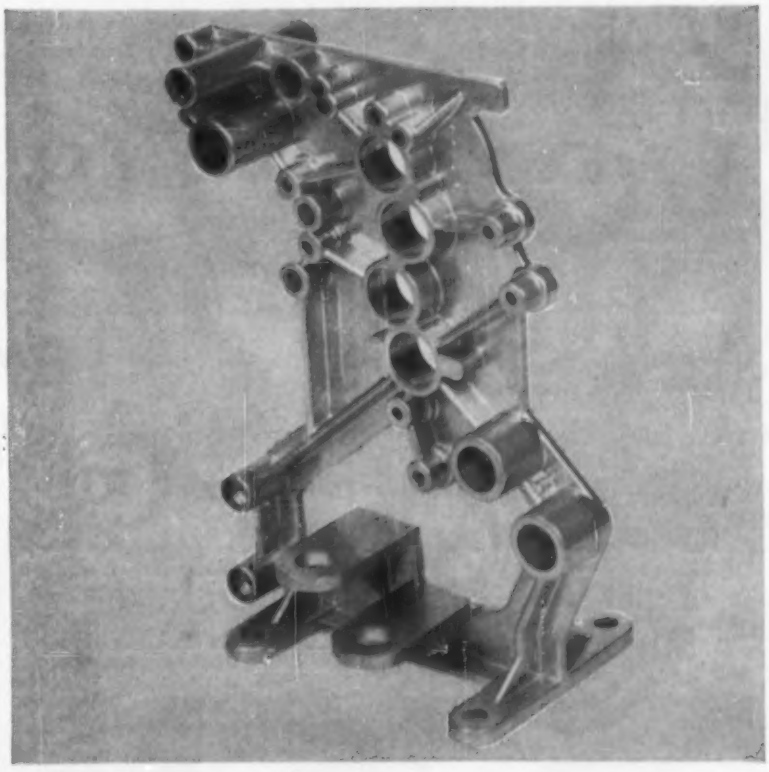
ZINC PLATE COATING . . . gives blue hue

A low priced, single dip, no-leach conversion coating for zinc plated surfaces has been developed for automatic equipment where facilities for added leaching and rinsing are not available.

Called Luster-On 52 Powder, it gives a bright bluish hue and provides corrosion protection against staining, and tarnishing, according to the manufacturers.

It is said to be suited for use where cost has prohibited the use of chromates in the past.

The Chemical Corp.
For more information, circle No. 214 on the Reader Service Card



What other process could do it so well?

All things considered, there's really only one *best* way to produce this chassis for an electric computer.

When you figure that it must be built at the lowest possible unit cost, must use a production method that is highly flexible to accommodate the unusual shape, and must maintain a variety of close tolerances . . . only die casting *could* do the job.

Also, working closely with Twin City engineers, this manufacturer *designed* for die casting to get the maximum out of the process. By thinking in terms of die casting right from the drawing boards he eliminated many production and finishing jobs, saved on unit costs, saved on machining.

Possibly you're producing a part by some more costly, less flexible, less accurate process than die casting. If you think that might be true, contact Twin City Die Castings Company. Twin City engineers can probably save you money. They have for hundreds of customers.

...only DIE CASTING can
✓ cut your costs
✓ offer such flexibility
✓ provide such accuracy

FOR PROOF... CALL, WRITE OR WIRE:

TWIN CITY DIE CASTINGS CO.
3351 TALMAGE AVENUE S. E. • MINNEAPOLIS 14, MINNESOTA
TELEPHONE MIDWAY 6-7528

For more information circle No. 65 on the Reader Service Card

CRUCIBLE STEEL AQUIRES VACUUM METALS CORP.

Crucible Steel Co. of America has recently acquired the interests of National Research Corp. in Vacuum Metals Corp. Now a wholly-owned subsidiary, Vacuum Metals was originally organized by National Research in 1946. Crucible purchased a 50 percent interest from National Research in 1954.

James H. Moore will continue as general manager of Vacuum Metals, which will be operated as a Crucible division under the direction of Walter H. Wiewel, Crucible senior vice president.

NAMED VICE PRESIDENT

The appointment of Sal Campodonico as vice president has been announced by the Allen-Stevens Corp., of Woodside, N. Y. Mr. Campodonico joined the company seven years ago as a mold repairman. As a result of the corporation's policy of promotion from within based on merit, Mr. Campodonico rose rapidly to the job of tool and die-maker and then to the position of plant supervisor.

Machining Eliminated...Parts Assembled Easily And Quickly Without Fasteners...Long Service Life Assured With...

ACCURATE Die Castings

■ Typical of the many cost saving die castings produced by ACCURATE are these electroplated corrosion-resistant zinc die castings which were used to manufacture a more efficient and eye appealing reel-type jalousie operator. Since the castings have a smooth non-porous surface and are held to close tolerances, they were used as-cast, thus eliminating costly secondary operations. In addition, the dimensional accuracy of the five spur gears and mounting posts permitted fast trouble-free assembly and lowered unit cost. Finally, to lock the component parts into a permanent dust-proof assembly five spinning or penning operations of the die cast metal were performed to eliminate the use of all fasteners.

If you are concerned with how to improve your products and lower costs, it will pay you to take advantage of our experience.

Major producer of Aluminum, Zinc and Magnesium Die Castings.

ACCURATE DIE CASTING CO.

3089-E 80th STREET • CLEVELAND 4, OHIO

For more information circle No. 3 on the Reader Service Card

OPPORTUNITIES

jobs & equipment

Opportunities rates: $20 for the first column-inch; $15 for each additional column-inch payable in advance. To answer box number advertisements, address responses to the box at Precision Metal Molding, 812 Huron Rd., Cleveland 15, Ohio. Closing date: 1st day of month preceding publication.

WANTED — Sales Trainee — metal powder producer; prefer man with practical powder metallurgy experience. Give complete background, salary expected, willingness to move and travel. Write Box No. 12156.

WANTED — die casting machines to rebuild and modernize for owner or for resale, by experienced organization, Toledo, Ohio area. Write Box No. 12256.

CASTING FOREMAN — Expanding West Coast investment casting firm has opening for man experienced in induction melting of ferrous and non-ferrous alloys to supervise casting section of new plant. Bone Engineering Corporation, 701 West Broadway, Glendale 4, California.

DIE CAST SUPERVISOR — Minimum of 10 to 15 years experience, including die construction, maintenance and operation. Complete knowledge of all major types of die casting equipment, auxiliary furnace equipment and gating and trimming operations. Experienced in metallurgy and the various aluminum alloys. Supervisory experience. Some tool engineering background necessary and academic engineering background desirable. Salary open. Reply to: Employment Department, Minneapolis-Honeywell Regulator Company, 17300 Western Avenue, Gardena, California.

FOR SALE: Lester, model HHP2, 5$ die casting machines; Stokes model P3 (80 ton) press; Stokes model S4 (40 ton) press; Stokes model F (4 ton) tablet press; Stokes model 43A granulator; Baldwin hyd. ingot presses (75-100 ton); Porter 27" (stainless body) ball mill loaders and unloaders; Day 80 gal. blender (stainless body) Hevi-Duty; lancaster mixer (open pan type) model EB3; Hummer screens (stainless) 40 mesh; all equipment in perfect condition and priced reasonable. Write for full information. Globe Trading Company 1815 Franklin St., Detroit 7, Mich., Phone WOodward 1-8277.

DIE CASTING SALES IN DETROIT— Well established manufacturer's agents in Michigan area, now representing a leading plastic molder, would also like to represent a die caster who has his own plating facilities. We now receive many inquiries from customers wanting both plastic and die cast parts. Write Box No. 12356.

SUBSTITUTE MATERIAL

continued from page 42

the oil groove is pressed in, so that the operation performed on the parts is the finishing down of one surface to establish proper thickness.

The spacing collars were once made by cutting them from sheet stock, but since material was needed, the cost was high. The bronze powder spacers are much less expensive. They are obtained in three different sizes for minimum stock removal.

This company's use of investment castings and powdered metal parts is likely to increase steadily, although machine tools are not manufactured in the large volume that are normally considered essential to justify tooling costs.

OPENS NEW OFFICE

Mannesmann-Meer Engineering and Construction Co., Inc. has opened a district office at Youngstown, O. to supplement the engineering and technical facilities of the company's headquarters staff at Easton, Pa.

For more information circle No. 1 on the Reader Service Card

NEW!

HIGH SPEED A.B.C. DIE CASTING MACHINE

Free Cycles Over 1000 Shots Per Hour

Here's the new A·B·C high speed, low cost die casting machine which eliminates costly production of small die castings on large die casting machines. Air operated, the machine produces small non-porous lead, tin and zinc alloy precision die castings up to 1½ lbs. The A·B·C is economical to operate and easy to set up. Its lightning production speeds makes single cavity molds practical and profitable.

STANDARD EQUIPMENT INCLUDES:
- 4 TIE BARS
- AUTOMATIC TIMING
- CALIBRATED TEMPERATURE GAS CONTROL
- GAS BURNERS
- DIE BLOCKS
- AIR REGULATOR
- FILTER
- OILER
- SAFETY SHOT INTERLOCK

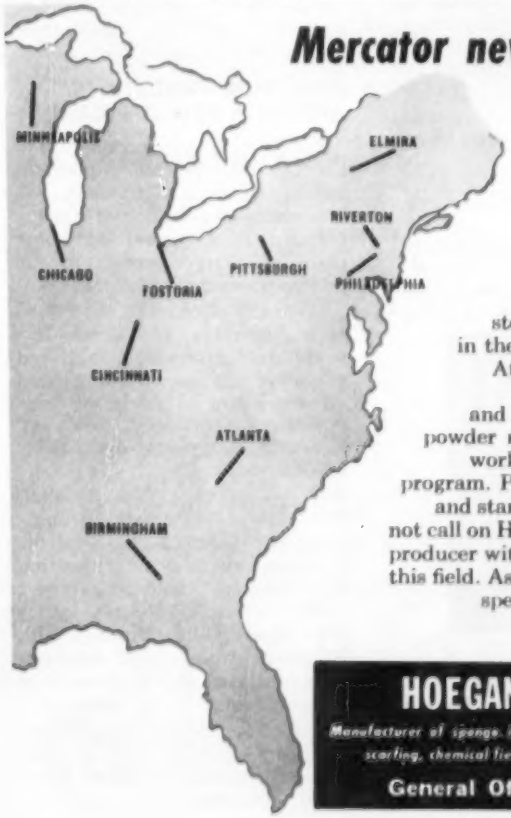
Write today for engineering data and prices. Ask for bulletin A-10.

A B C

DIE CASTING MACHINE CO.

400 E. 142nd ST. • DOLTON, ILL.

Mercator never projected a map like this . . .



. . . in one short year, HOEGANAES sales and service centers have sprung-up all over the map. More expansion to come . . . with improved powder metallurgy technical know-how next door to your operation — available at your call.

Hoeganaes, producers of sponge iron and stainless steel powders, have strategically located sales engineers in the important marketing areas of New England, Middle Atlantic, South Atlantic, and the north and south Central States. Next comes the equally important Mountain and Pacific Coast areas. This means that metal powder and powder metallurgy specialists are available nearby; ready to work with you on your metal parts program. Powder metallurgy is producing new and startling results from day to day. Why not call on Hoeganaes . . . the metal powder producer with over 40 years experience in this field. Ask for the help of a Hoeganaes specialist. He's at your service.

HOEGANAES

HOEGANAES SPONGE IRON CORPORATION

Manufacturer of sponge iron, stainless steel, and special alloy powders for powder metallurgy, cutting and scarfing, chemical field, plastic industry, atomic energy, welding electrodes, and other industrial uses.

General Offices and Plant • RIVERTON, NEW JERSEY

For more information circle No. 33 on the Reader Service Card

NEWS OF INDUSTRY & ASSOCIATIONS

activities of people, companies & groups in the precision metal molding industries

NEW DESIGN AND ENGINEERING MANUAL TO BE PUBLISHED BY INVESTMENT CASTERS

Final plans for a new design and engineering manual for investment castings were put into motion by members of the Investment Casting Institute at their Fall meeting in Detroit in November. The manual will come off the press early in May 1957.

At the largest meeting yet held by the organization, new officers and directors were elected.

New president of the Institute is K. W. Thompson, president of the K. W. Thompson Tool Company, New Hyde Park, N. Y.; vice president, P. W. Schipper, manager of the Investment Casting Division of the Howard Foundry Company, Milwaukee; treasurer, V. S. Lazzara, president of Casting Engineers, Inc., Chicago.

Directors, elected for two-year terms include C. R. Whittemore, chief metallurgist, Deloro Smelting & Refining Company, Deloro, Ontario, and R. C. Kramer, assistant sales manager, Kolcast Industries, Inc., Cleveland.

Elected for a one-year term as a director was V. S. Lazarra, retiring president of the Institute.

Directors remaining on the board include W. A. Dubovick, president, Engineered Precision Casting Company, Matawan, N.J.; W. L. Worthen, president, Bone Engineering Company, Glendale, Calif.; and R. R. Miller, president, Precision Metalsmiths, Inc., Cleveland; and W. I. Matthes, executive vice president, Arwood Precision Casting Company, Brooklyn, N. Y.

Executive director of the Institute is Harry P. Dolan.

In addition to two days of business and technical meetings, the ICI sponsored a full day symposium on vacuum melting and casting. This session drew a packed house to hear papers and discussions by Dr. Jack Keverian, A. J. Kiesler and W. F. Moore of General Electric Co., Dr. Nicholas J. Grant and Dr. H. F. Taylor of Massachusetts Institute of Technology, James J. Moore of Vacuum Metals Corp., H. D. McIntire of Battelle Memorial Institute and Dr. F. N. Darmara of Utica Drop Forge and Tool Co.

J. J. PUNKE TO HEAD PRECISION CASTINGS

The Board of Directors of Harsco Corporation has appointed J. J. Punke executive vice president of its Precision Castings Division. The office of president was abolished upon the resignation of W. J. During, Sr.

Mr. Punke will be in complete charge of all the operations and affairs of Precision Castings, it has been announced by J. T. Simpson, president of Harsco Corporation.

Prior to his recent elevation, Punke was senior vice president in charge of engineering and manufacturing at Precision Castings Co.

Mr. Punke first joined Precision in 1937 and had a diversified background in all production processes, evaluating many sources of supply for General Motors, Hupp Motors, Studebaker and Packard.

Realizing that the die casting industry, in an era of unprecedented growth, must standardize many of its procedures to meet

J. J. Punke

widespread industry demands, he has, as a member of the Standards Committee of the American Die Casting Institute, crusaded for standardized practices within the industry.

NEW PLASTIC BUYS LANSCO DIE CASTING

New Plastic Corp. of Los Angeles, Calif. has purchased the Lansco Die Casting Co. of El Monte, Calif. as a wholly-owned subsidiary, according to J. A. Carmien, New Plastic president. The company manufactures Nupla hammers, with die cast bodies and soft faces.

All key personnel of Lansco have been retained, and William B. Lane will continue to direct the company as president and general manager. Lansco has a die making and die casting plant with more than 7,000 square feet under roof and 10,000 square feet of property available for expansion.

New Plastic has also announced the appointment of John Schmidt as vice president in charge of sales. He will head sales organization and promotion for the company and its subsidiaries, Lansco and Adonis Tile Co.

ALUMINUM INDUSTRIES APPOINTS NEW OFFICERS

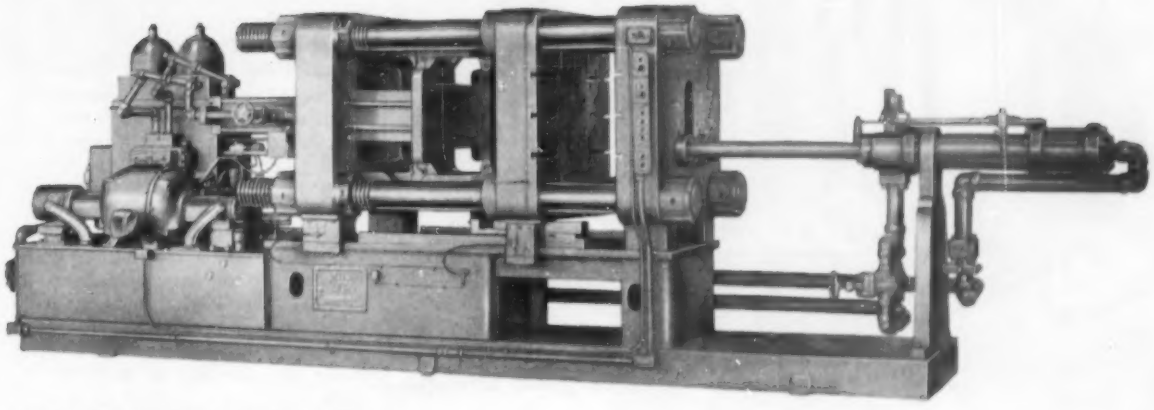
Harrison O. Ash, president and general manager of Aluminum Industries, Inc., Cincinnati, has announced the election of a number of new officers of that company, as a development of the progressive expansion program.

Robert E. Hater, long associated with Aluminum Industries, Inc. in different production, sales and executive capacities, was elected vice-president in charge of original equipment sales. Scott M. Kennedy, director of sales, parts division, was elected vice-president in charge of the division; H. S. Riley, formerly sales manager of Toledo Steel Products Company, division of Thompson Products, Inc., was appointed sales manager, Permite parts sales Merle Wolff, formerly with Aluminum Company of America, was appointed acting director of personnel and labor relations.

Aluminum Industries manufactures a diversified line of products in its plants located on Werk Road, Cincinnati.

PEMCO* die castings cut the world's lawns...and

KUX cuts Pemco's costs



THE MAMMOTH KUX HP-38

Hydraulically operated cold chamber model for the production of die castings from aluminum, brass or magnesium.

Also available in plunger gooseneck model for the production of die castings from lead, tin or zinc

Model BH-38

KUX
MACHINE COMPANY
6725 North Ridge Avenue, Chicago 26, Ill.

Builders of a full range of die casting machines... from 25 tons to 1000 tons in size.

*PEMCO, trade name of PRODUCT ENGINEERING AND MANUFACTURING CORPORATION, Bridgman, Michigan, uses many sizes of KUX Die Casting Machines to produce top quality die castings for industry.

The rotary lawn mower housing illustrated is an example of the high quality large die castings made by Pemco for leading producers of lawn mowers and other major household appliances. To make them with speed and cost-cutting efficiency, Pemco relies on the mammoth Kux HP-38, with its exceptional capacity for large dies, coupled with ease of mounting, tremendous metal injection pressures and plunger speed.

This one piece aluminum die casting measures 24" x 24" and weighs 15 lbs. Produced at an average speed of 60 castings per hour, with the aluminum injected into the die at a pressure of more than 5000 lbs. PSI, a die locking pressure of 750 tons is required. Thus the HP-38, having this capacity, has proven to be the ideal machine to accomplish this die casting job.

If you have a casting problem of unusual size or intricacy, come to Kux, where no die casting problem is too big or too small for our experienced engineers to solve to your advantage.

For more information circle No. 37 on the Reader Service Card

METAL POWDER ASSN. PUBLISHES PROCEEDINGS

The Metal Powder Association has just released the Proceedings of its 1956 annual meeting. Devoted to advances in all fields of powder metallurgy, the two-day meeting took place in Cleveland, Ohio in April. The 130-page Proceedings includes all technical papers, illustrations and discussions. Copies of the Proceedings may be obtained from the Metal Powder Association, 130 W. 42 St., New York 36, N.Y., at $3.00 per copy. Reprints of individual papers are not available.

Papers published in the Proceedings are as follows: *Age Hardenable Brass Alloys through Powder Metallurgy*, E. A. Anderson and E. H. Rennhack; *The Use of Sintered Metal Parts in IBM Products*, A. Stosuy; *Replacement of Castings by Powder Metallurgy*, T. L. Robinson; *Application of Powder Metallurgy in Nuclear Engineering*, H. H. Hausner; *Powder Metallurgy in the Electrical and Electronics Industries*, A. S. Doty; *Some Aspects of Sintering Furnace Maintenance*, G. Otto.

Panel Discussion on Sintered Structural Materials, J. M. Copeland, Moderator, *Medium Density*, R. Talmage, *High Density*, W. J. Doelker, *Infiltrated Parts*, C. G. Johnson; *Influence of Lubrication and Die Surface on the Pressing Characteristics of Metal Powders*, I. Ljungberg and P. G. Arbstedt; *Aluminum Powder Metallurgy Products*, J. P. Lyle, Jr.; *Ceramic-Metal Friction Materials*, L. D. Hower, Jr. and R. E. Steck; *The Manufacturing and Applications of Heavy Alloy*, J. F. Kuzmick; *Changing Trends in Engineering Education*, K. B. McEachron, Jr.

DIE CASTING DIE DESIGN IS TOPIC FOR MEETING

Principles of die design for die casting will be outlined before the December meeting of the Cleveland Chapter of the Society of Die Casting Engineers December 18. Speaker will be Duncan Hannah, partner in the Detroit firm, Die Cast Die Designs, specialists in this field of tool design.

Mr. Hannah's talk is expected to cover the basic principles which assure optimum die operation, minimum alterations and maintenance, and least expense. Correct die design, Mr. Hannah will prove, can reduce the number and cost of such secondary operations as sanding, polishing, buffing and similar operations. Open discussion of die design problems will be a feature of the session. Dinner is scheduled for 6:30 P.M., with the meeting to start at 8 P.M.

The chapter on November 20 elected the officers for the coming year: chairman, Harry Cagin, Halex Die Casting Co.; vice chairman, Arnold Williams, Cleveland Hardware & Forging Co.; secretary-treasurer, Robert D. Black, Rex Oil & Chemical Co.; trustees, Joseph A. Goldsmith, Buckeye Mold & Die Co. (chairman); David M. Morgenstern, Nelmor Mfg. Corp.; Fred Neumann, Conneaut Die Casting Co.; John W. Palmer, Cast-Master, Inc.; John Ryder, Ford-Sandusky Plant; and John B. Schoonover, Helfrick Die Cast Products Co.

At the same meeting, Mr. Morgenstern spoke on vacuum die casting. He discussed the general theory of vacuum casting, why many of the older schemes had failed and the advantages of using a housing over the die blocks for evacuation as contrasted with direct evacuation of the die cavity. Examples of vacuum die cast aluminum were shown.

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USEFUL LITERATURE

continued from page 64

Direct Flow Pumps: 176

Aldrich Pump Co., 4-page data sheet. Data sheet 100 contains complete information on the company's line of 25 hp to 2400 hp direct flow pumps. Designed as a quick reference source, the condensed catalog presents dimension tables and a pump selection chart in addition to design and material specifications.

Box Furnaces: 177

General Electric, two-color folder. Bulletin GEC-1402 includes specifications, temperatures, ratings, and dimensions of the company's box-type furnaces with cooling chambers for low production and laboratory applications.

Work-Holding Equipment: 178

Universal Vise & Tool Co., 16-page catalog. Catalog 9156 gives full information on the company's line of machine tool vises, angle vises, adjustable angle plates, adjustable lathe fixtures, safety work holders for drill presses, quick-acting vises, large-capacity mill table vises, and parallel clamps.

Aluminum Alloys: 180

Alloys & Chemicals Mfg. Co., 61 pages, 2-color reference and data book. Published for foundrymen's use, this illustrated book is a condensed reference source on aluminum alloys, their characteristics and behavior. Among its features are an up-to-date tabulation of government agency and technical society specifications, and four pages of comparative specifications.

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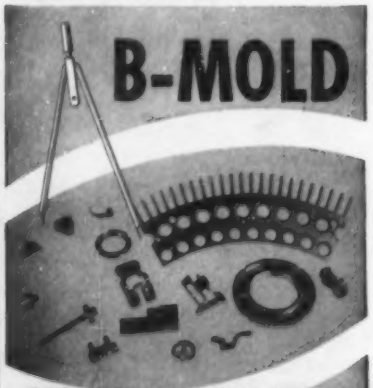

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Bonded Metals: 181

Al-Fin Div. of Fairchild Engine & Airplane Corp., 2-color folder. Four applications of the company's process for the molecular bonding of aluminum, magnesium and their alloys to steel, cast iron, nickel and titanium are described in the October issue of the company's monthly publication. Detailed photographs illustrate the applications in both military and civilian products.

Colloid Lubricants: 182

Acheson Colloids Co., div of Acheson Industries, Inc., 6-page folder. Bulletin 423 is a compilation of current practice in high temperature lubrication with colloidal dispersions. Case histories in the use of the company's 'dag' dispersions are included.

FINISHING

Hot Spray Finishing: 183

The Spee-Flo Co., 28-page brochure. This brochure explains the hot spray process in which controlled heat is applied to finish materials to maintain a constant viscosity. Advantages of the process are discussed, and the company's line of hot spray equipment is described.

Grinding & Sanding: 184

Merit Products, Inc., 2 folders and price lists. The company's line of flexible grinding and sanding wheels is described. Known as Grind-O-Flex, the grinding unit claims a new principle in abrasive metal finishing and light grinding, with uses ranging from smoothing and polishing to light-grinding flat and contoured surfaces.

Cleaning & Oxidizing: 185

Sulphur Products Co. Inc., two 8-page brochures. An oxidizing agent for copper, silver, and brass finishing and a toner and conditioner for use in zinc plating are described in two brochures. Directions for use and price lists are included.

Automatic Cleaning: 186

Ransohoff, two-color folder. Automatic metal cleaning and surface treatment machines manufactured by the company are discussed and illustrated. Four models in varying sizes are included, with a typical automatic sequence of 14 operations explained.

Silver Brazing Alloys: 188

Handy & Harman, 2-color folder. Seven case histories on the use of the company's "Easy-Flo" brazing processes are given. Gas tightness, high strength, and good electrical and heat conductivity are some of the properties emphasized.

Finishing Compounds: 190

Formax Mfg. Corp., 12 page catalog. Catalog No. 61 describes the company's line of polishing, buffing, and burring compounds and "Flex-a-Glu" polishing wheel cement. Included are brief explanations of the applications of polishing, buffing and coloring and burring.

Barrel Machines: 195

Frederic B. Stevens Inc., 2-page bulletin. Economies and advantages of the company's line of automatic barrel machines are described. The built-in drying unit, versatility, dragout reduction, ease of installation are discussed.

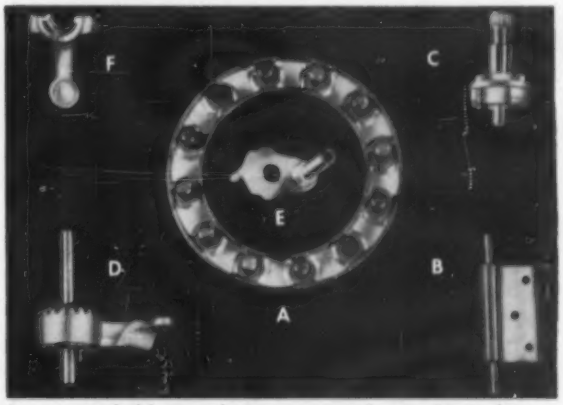
Continued next page

Costs Too High? solution may be—

ALUMINUM and MAGNESIUM

DIE CASTINGS with INSERTS

There are many ways inserts can serve the die casting designer. While maintaining well known advantages, they provide special properties in the die casting, which include such features as improved bearing characteristics, magnetic properties, shear and bending strength, corrosion resistance, wear resistant threads and shafts. The designer can use inserts as fastening devices, such as screws, studs, clips and threaded bushings.



Inserts are held securely in a casting by mechanical interlocking with the cast metal. The shrinkage of the cast metal as it cools makes the metal grip the insert firmly. Sometimes inserts are used to eliminate machining operations on castings.

Frequently curved passages inside of a casting which are impossible to core can be formed by inserting bent tubes. Sealed heating elements gain exceptionally good protection against abuse and excellent heat transfer characteristics when die cast as inserts.

The broad scope of uses for die castings with inserts is indicated in the photo above, which includes: A-fuel cell opening reinforcement ring with cast-in steel dome nuts; B-hinge for outboard motor cover with cast-in steel shaft; C-window regulator rotor with cast-in steel shaft; D-throttle control gear with cast-in brass shaft; E-phonograph control arm with cast-in brass tube; F-refrigerator compressor connecting rod with cast-in bronze bearing.

Let's Talk It Over . . .

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By F. S. Ross, Vice-President in charge of Engineering Centr-O-Cast and Engineering Co.

Up to a few years ago, the centrifugal casting process was employed primarily to manufacture such items as bronze bushings and cast iron soil pipe . . . items that were either machined in their entirety or destined for applications where finish and accuracy were not important. However, centrifugal casting techniques began to improve with the experience gained casting bronze for armaments and railroad equipment. More accurate castings became possible, and faster production machinery developed.

The inherent good qualities of centrifugal castings had long been recognized: denser structure, more homogeneous mass, higher yield. For high-quality, low-production parts, the process was ideal, and it was felt that this type of casting would eventually dominate in any application where consistent quality was a prerequisite. The only drawback had been high production cost. Now, as older, slower foundry methods were replaced by efficient techniques and equipment, that drawback was removed.

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USEFUL LITERATURE

continued from page 64

Powder Metal Chromizing: 187

Chromalloy Corp., 2 pages. An illustrated reprint discusses the company's process which creates rust- or wear-resistant surfaces on powder metal parts without the danger of internal attack by entrapped plating solutions and with a minimum of dimensional change. The process involves high temperature diffusion of chromium into these surfaces.

Contact Wheels: 189

Chicago Rubber Co., Inc., 2-color folder. Smooth and serrated faced contact wheels made by the company are described. The wheels are built with a solid aluminum hub and a choice of four grades of rubber. The three types of serrations on the faces of the wheels are illustrated and their applications described.

Pressure Tape: 191

Behr-Manning Co. div of Norton Co., 20 pages, product data book plus price list. Construction, physical properties, characteristics, uses, standard roll sizes and standard packing of the company's line of pressure-sensitive tapes are described. Data is presented on 20 different types of tape.

Buffing Data: 192

Formax Mfg. Corp., 11-page reprint. Entitled "Polish Up Your Buffing Data," this illustrated booklet is a practical and technical presentation on the subject of polishing and buffing materials. A wide variety of abrasives, adhesives, polishing wheels and buffing compounds are treated as to their nature, construction and purpose.

Plating Solution Analysis: 193

Hanson-Van Winkle-Munning Co., 32-page technical bulletin. Twenty-eight analytical methods for testing nickel, copper, silver, and other metal finishing solutions are outlined in detail. Other sections describe necessary equipment, component chemicals of solutions, atomic weights, acid concentrations, and electrochemical data. Conversion tables and lists of analytical reagents for 11 plating solutions are also given.

Lock Nut Assembly: 194

The Palnut Co., 8 pages, catalog and assembly date. High speed assembly methods using the company's line of lock nuts and fasteners with specially designed low-cost tools are described. Descriptions and dimensions of the nuts, fasteners, and various wrenches and applicators are included.

Polishing and Buffing: 196

Acme Mfg. Co. Two booklets. Semi-automatic and rotary automatic polishing and buffing machines manufactured by the company are described. Accessory equipment for the automatics is described and preliminary cost and procedure estimate blanks are provided.

Alloys Reference Chart 197

Henning Bros. & Smith, Inc., wall chart. A comprehensive wall chart describing brass, bronze, and nickel silver casting alloys is now available. The 17 x 22-inch chart gives detailed information on 37 standard alloys, including their Navy, S.A.E., A.S.T.M., and Federal specifications, and chemical compositions by percentages.

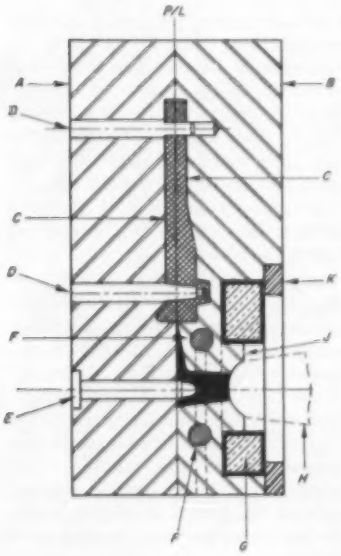
How To Control Temperature In Die Casting Dies

Part 6 – Die Design For Heat Control

By W. M. HALLIDAY

THE most common practice followed by die casting engineers to establish the correct rate of heating and the heat distribution over the vital cavity zone is one employing some means for *cooling* this hot region in a die. The facility with which such means can be incorporated and the success attending its use depend to a large extent upon the following factors:

1. The complexity or simplicity of the cavity,
2. The disposition of the cavity or cavities and particularly the distances the remoter walls lie from the sprue channel.
3. The kind of runner/gate feeding system and the lay-out adopted for these channels,
4. Whether other important working mechanisms are embodied in the die close to the sprue and gated end of the cavity preventing the use of the selected cooling means,
5. The scale of heat fluctuations to be corrected.



1. SIMPLE SPRUE cooling utilizing water channels and a beryllium copper ring can be used when the largest mass of metal is adjacent to the sprue channel and lies mostly in the stationary die block.

In the case of particularly simple dies where the cavity is small in volumetric capacity and has only a small superficial surface area, and where all cavity walls are situated reasonably close to and about the same distance away from the mouth of the sprue channel, it is often possible to combine cooling provisions for the cavity area with those for, the sprue bushing.

The diagrams given at Figures 1, 2 and 3 show other unusual methods for achieving heat-control and temperature stabilization in dies having cavity forms and lay-outs of a more complex character, and where separate cooling systems must be employed.

These cooling arrangements to be described, can be employed in cases where the die-blocks are fitted with numerous other mechanisms such as cores and ejectors, which often precludes the more orthodox water-cooling provisions.

The sectioned diagram, Figure 1, shows a die design for producing a rectangular casting whose surface area is large and whose base-wall thickness varies considerably over the length. A thick bossed-up wall section joins a very much thinner portion, as indicated by diamond-hatched lines. The cavity lay-out selected consists of locating the deepest end of the cavity adjacent to the sprue channel so that the gate feeds directly into the much heavier mass of metal in the casting.

A and *B* are the movable and stationary die-blocks, and the parting-joint surface of each contains a portion of the cavity matrix as at *C*. Core-pins *D* are fastened within the movable block and the finished casting is stripped by the usual sliding ejector-rods mounted in the die-block as before, but which are not shown in the accompanying diagram.

The sprue channel in this example is cut into the stationary block *B*, and a separate sprue bushing is not employed. This is quite common design practice with dies of relatively simple form and where very large quantities of castings are not to be produced. A sprue distributor-pin *E* is mounted in the block *A* to deflect the flowing alloy to the runner and cavity.

Because of the considerable volume of molten alloy contained at any instant during injection in the sprue channel, runner and lower deepest end of the cavity, this region will tend to over-heat. Thus in the interests of successful die casting some heat-control will be essential.

The sprue channel in this case is cooled by means of the water channels *F* which are simply drilled holes passing horizontally across the die-block *B*, one above and the other below the channel as shown. At one end the parallel holes *F* are joined by a vertical hole started in from the underside of the block, and which extends slightly beyond the upper hole. The entrance end of this third hole is plugged for a water-seal.

The regulated supply of cold water is fed into the lower hole *F*, the upper hole being the outlet for the steam. This arrangement gives a flow of cooling water around three sides of the sprue

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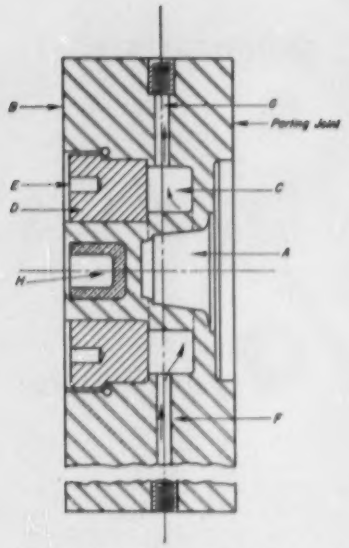
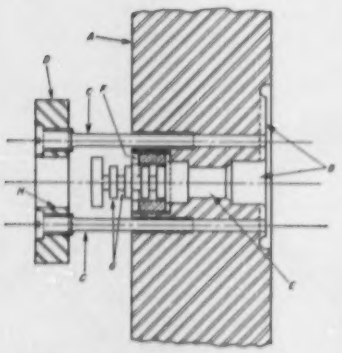


2. FOR HEAVY sections that are adjacent to thin sections of a casting the water cooling scheme shown here may be used. The size of the cooling channel C is regulated according to the size of the heavy boss.



3. WHERE WATER cooling is impractical, a copper plug located at the base of a deep recess can be used to conduct heat away from the die block and radiate it to the air.

HEAT CONTROL—continued

channel and is reasonably satisfactory.

In practice, with such a die design this simple sprue cooling system will be inadequate to insure close heat control over the affected cavity region. Additional cooling means is provided in the following unusual way. A large diameter recess is machined deeply into the rear side of block *B* to receive the beryllium-copper ring *G*, whose bore is considerably larger than the injection nozzle *H*.

The bore of the ring fits closely upon the short cylindrical spigot *J* formed concentric in the recess in the die-block. This spigot contains the nozzle seating, and the injection nozzle is thereby located a certain depth within the die-block, see broken lines. The outside diameter of the ring *G* is a clearance fit within the recess. This dimension is large enough to ensure that the ring lies immediately behind the bossed-up deepest portion of the cavity.

The depth of the recess at this point is determined so as to leave about ¼ in. thick base-wall between the beryllium-copper ring and the cavity floor at that point. Steel ring *K* press-fitted into the shallow step at the mouth of the recess retains ring *G*. It is fastened to the die-block by several cap-screws (not shown), and its bore is about ½ in. less than the outside diameter of ring *G*. Thus the major portion of the right-hand sideface of ring *G* is freely exposed to the atmosphere.

In operating this dual cooling system, the flow of water through channels *F* can easily be regulated to control the temperature of the sprue channel. Any excess heat accruing in the die wall surrounding the deepest (gated) end of the cavity becomes rapidly transferred through the thin intervening die wall to the beryllium-copper ring. *G*.

Because of the high thermal-conductivity of this member, some of the heat is smoothly distributed to other adjacent regions of the die-block, and some is dissipated normally to the air. By carefully pre-determining the thickness or mass of ring *G* efficient control can be instituted in a simple, reliable and inexpensive manner.

Figure 2 shows another means for controlling die temperatures and regulating heat distribution around the cavity area. The casting produced by the die design shown is of a more complex shape than those previously considered, raising problems of thermal control.The great disparity in wall thickness and the uneven massing of metal in the casting results in grossly unequal shrinkage effects when the casting solidifies.

The entire external form of the casting is produced from a single cavity matrix *A* in the stationary die-block *B*. The casting has a long, massive, conical boss adjoined to one side of a large rectangular flange, where the wall thickness of the latter is several times *less* than that of the boss wall. Despite slight coring of the latter by a small blind hole up the center, great disparity remains.

Heat regulation here relates chiefly to the walls of the cavity and in particular consists in unifying heat distribution away from this region. In operation, heat will rapidly accumulate in the walls of the die cavity around such a boss, due to the large volume of molten alloy injected therein per 'shot'. Little of this excess heat should be transferred to the cavity walls of the shallow flange area to avoid overheating this part of the block.

The accruing heat must either be transferred to less critical regions of the die, or be dissipated to the air. If this is not accomplished, the effect of overheating at this boss region will be to increase the time required for the boss on the casting to solidify before being ejected from the die. An unduly long pre-ejection dwell, however, would be highly undesirable in that it permits an excessive amount of shrinkage to occur in the thin-walled flange portion of the casting, whose solidification-rate is much faster than the boss portion. This condition would lead to a serious difficulty, ie., that of controlling precision dimensions on the flange.

A still more serious condition would also ensue with such an improperly heated die. Since the mass of alloy contained in the boss portion requires a much longer time to solidify sufficiently for safe ejection, than does the thin section in the flange, grossly unequal shrinkage will develop before the casting can be ejected from the die.

As the heavy mass of alloy in the boss cools and solidifies it tends to 'draw' additional molten alloy from some source to compensate for the loss attendant upon the considerable shrinkage. Some of this compensating alloy can of course be drawn from that remaining in the runners and sprue channel, but a portion should be drawn from the outer flange to ensure best casting conditions.

This process cannot take place, however, because the thin section of the flange will have solidified much earlier. As a result, the

Continued next page

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casting may suffer seriously from internal shrinkage-porosity in the boss walls; or display drastically weakening cracks where the flange joins to the base of the boss. Even with mild overheating of the boss region, this compensating 'draw' action of the shrinking alloy would cause serious 'sinks' in the boss itself, or even in the flange around the root of the boss.

To eliminate these, heat development and distribution in the critical cavity walls must be carefully regulated. This may be accomplished by the cooling system shown in Figure 2, in addition to the water-cooling in the sprue bushing (which are here omitted for clarity.)

A deep recess *C* is machined in the non-parting joint side of block *B*, the sizes of the recess being determined so as to leave a fairly uniform thickness of wall around the conical boss portion of the cavity and the same thickness of die metal between the base of the recess and the shallow flange-forming part of the cavity.

A steel sealing plug *D* is screwed tightly into the left-hand end of the recess, tommy-pin holes *E* being provided in the member for locking purposes.

A water-inlet hole *F* is drilled vertically from the bottom side of the die-block to pass into recess *C*. A similar size outlet hole *G* is drilled into the recess from the top side of the die-block to lie opposite to inlet *F*. By this means a flow of water may be passed around the critical boss walls of the cavity to draw-off any surplus heat.

The die metal at the base of the boss cavity formation also requires careful cooling so as to avoid surface defects on the cast due to overheating. This is achieved simply by boring a hole into the block from its left-hand side. This hole is located in line with the boss and is about the same diameter as same. In depth the hole is extended so as to leave about the same thickness of die wall as with recess *C*. Fitted tightly into this blind hole is the beryllium-copper hollow plug *H*. This has substantially thick walls and is open at one end where it finishes flush with the left-hand side of the die-block.

This plug in the high heat-conducting metal ensures that a useful proportion of the surplus

heat in the cavity region is drawn evenly and quickly away to be dissipated to the outer air. By carefully determining the thickness of the walls of the hollow plug *H*, by actual running tests, heat transfer can be reliably regulated.

Figure 3 illustrates another type of heat-control adapted for use with a die containing a deep cavity, but which cannot be regulated by conventional water-cooling, owing to the presence of movable ejectors which lie very close to the cavity walls. The movable die-block *A* contains the portion *B* of the cavity, which indicates the main external shape of the casting. The latter comprises a thin circular flange to which is joined a heavy solid boss. The casting has to be ejected by a set of rods *C* sliding through the die-block. All the rods are mounted on rail *D* for simultaneous action. The rods are located extremely close to the walls of the boss cavity, thereby preventing the use of water-cooling channels.

A hole of three different diameters is bored fully through the die-block to lie perpendicular to its parting-joint surface. The smallest diameter of this hole is equal to that of the boss cavity at its deepest point, and is exactly in axial alignment with the cavity as shown.

A long shouldered plug *E* is press-fitted into this hole, and is set so that its inner endface blanks off the boss cavity to the required length. Mounted in this position the shoulder on the plug fits closely within the middle diameter of the hole and up against the square step formed therein.

A copper sleeve *F* is screwed into the largest (threaded) portion of the hole, and its purpose is to hold the plug firmly in the correct longitudinal setting relative to the boss cavity. The sleeve is bored slightly larger than the plug, and the latter extends an appreciable distance out of the left-hand end of the sleeve, to pass well beyond the adjacent side of the die-block. Plug *E* is in copper, or beryllium-copper, or some similar metal having a much greater heat conductivity than the die metal.

The plug has a series of annular grooves machined at equal distances apart around its periphery as shown at G, to increase the radiative surface area.

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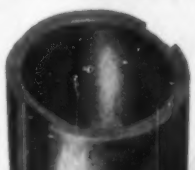

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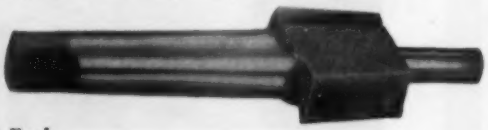

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Meetings are normally held on the third Thursday of each month, September through June at the auditorium of the Michigan Consolidated Gas Co.

Officers for the year are: A. R. Henderson, Ford Motor Co., president; Victor Gallatin, Federal Mogul Corp., vice president; John Check, Chrysler Amplex Div., treasurer; J. I. Farmer, Greenback Industries, Inc., secretary.

The November meeting, held on November 29, featured a paper by F. J. Norton of the New Jersey Zinc Co.

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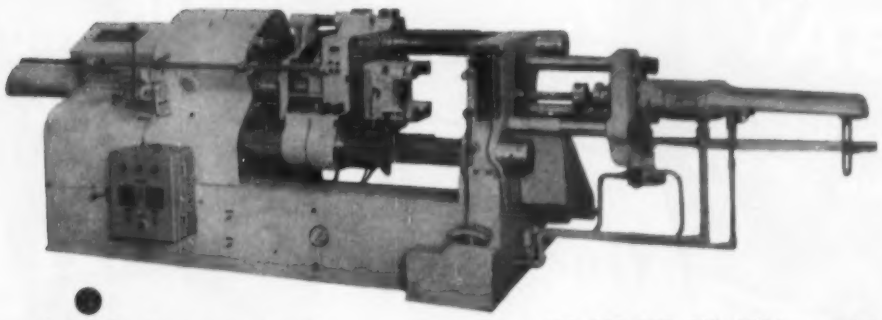

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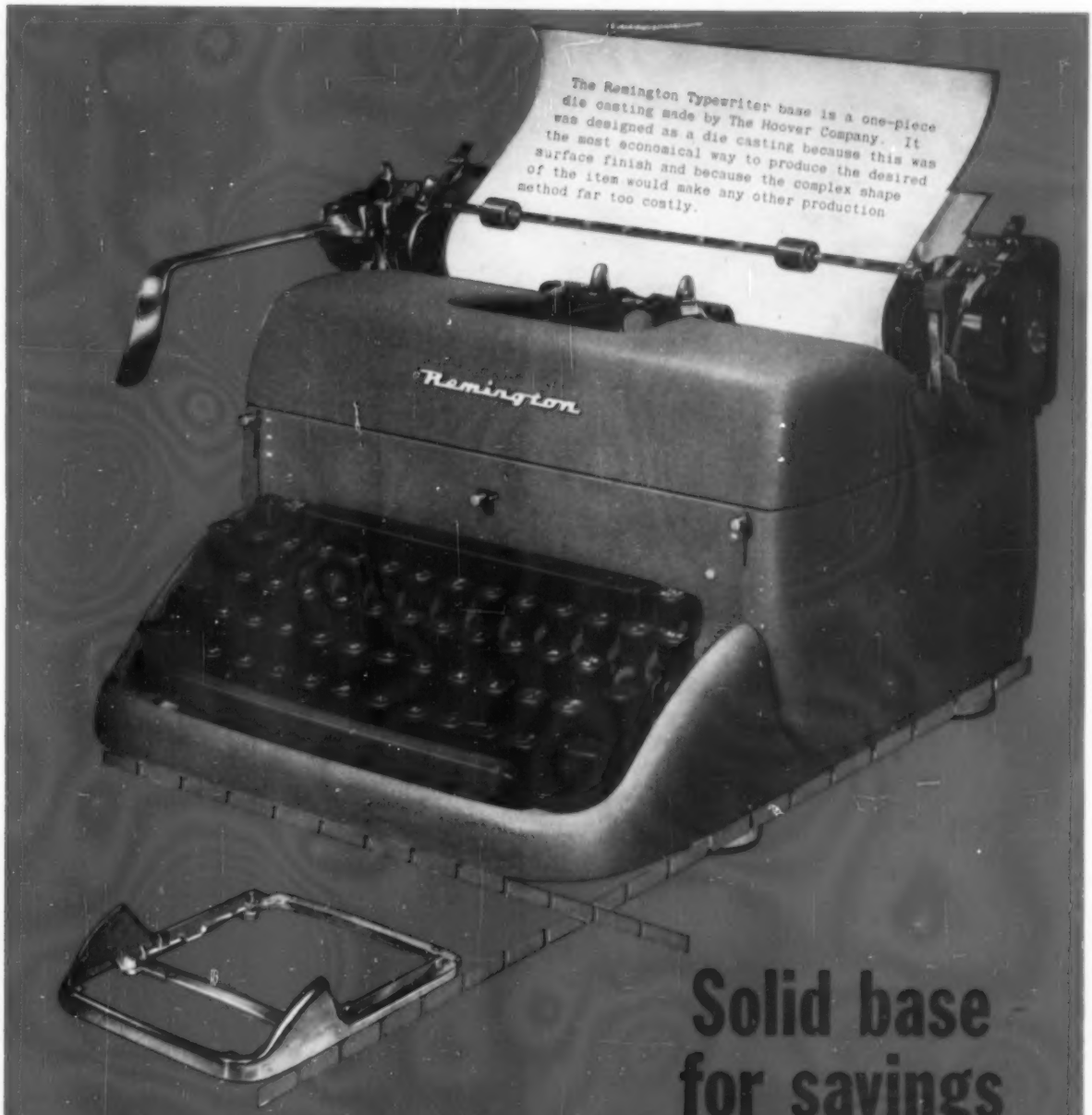
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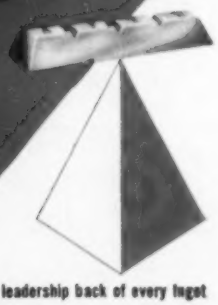

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